

INTRODUCTION TO THE STUDY OF THE SOUL

CHARLES DE KONINCK
Dean of the Faculty of Philosophy
Laval University, Quebec, Canada

A Preface to *Precis de Psychologie Thomiste*

by

L'Abbe Stanislas Cantin, D. Ph.
Professor at Laval University

Translated by Bruno M. Mondor, O.F.

Edited by Vincent M. Martin, O.F.

(Pro Manuscripto)

* * *

Dominican House of Philosophy
Saint Joseph's Priory
Somerset, Ohio

1951

CONTENTS

- I. THE STUDY OF THE SOUL AND THE STUDY OF LIVING THINGS
- II. THE EXPERIENCE OF LIVING
- III. OUR CERTITUDE OF LIFE
- IV. THE INVERSE PROPORTION BETWEEN CERTITUDE AND CLARITY
- V. THE ORDER TO BE FOLLOWED IN THE STUDY OF LIVING THINGS
- VI. THE PROCESS OF CONCRETION IN THE STUDY OF LIVING THINGS
- VII. THE TWO GENERA OF UNIVERSAL CAUSES IN THE STUDY OF LIVING THINGS
- VIII. THE INTERMEDIATE CHARACTER OF OUR SCIENCE
- IX. THE SO-CALLED "CONCEPT GAME"
- X. ABSTRACTION IN THE PROCESS OF DEMONSTRATION
- XI. ABSTRACTION AND CONCRETION IN THE STUDY OF LIVING THINGS
- XII. THE TREATISE ON THE SOUL AS "HISTORY"
- XIII. CONCRETION OF THE EXTERNAL SENSES AND ABSTRACTION
- XIV. THE EQUIVOCATION ON "SENSIBLE MATTER"
- XV. SENSIBLE MATTER AND NATURAL DEFINITIONS
- XVI. THE PROCESS OF INTENTION AND OF COMPOSITION
- XVII. THE PROVISORY CHARACTER OF SCIENTIFIC THEORIES
- XVIII. LIFE IN THE UNIVERSE
- xix. ENDNOTES

ACKNOWLEDGEMENT:

It is a pleasure to acknowledge the assistance of those Brethren who so unselfishly contributed their time to the publication of this translation. The translator is especially grateful to Bro. Bertrand Boland, O.P., who undertook the laborious work of proofreading and who supervised the stencilling of these many pages. To Bro. Gerald Christian, O.P., we are sincerely grateful for the mimeographing of this opus. May this little philosophical treatise happily fulfill the end for which it has been translated.

B.M.M., O.P.

Feast of the Epiphany, 1952

The author of this little treatise has asked me to expose by way of introduction, some considerations preliminary to the study of the soul. Since this book is destined for young people who are studying the subject for the first time, it is to them that I address myself.

I. THE STUDY OF THE SOUL AND THE STUDY OF LIVING THINGS

If one deviates slightly from the truth in the beginning, the deviation will increase thousands of times as a natural consequence. (1) That is why one must never pass cursorily over the preliminaries of a doctrine, or presume that they are sufficiently known; they merit on the contrary all our attention. This useful comparison is found in The Purloined Letter of Edgar Allan Poe: "The principle of the force of inertia, for example, seems to be identical in physics and metaphysics. It is not more true in the former, that a large body is with more difficulty set in motion than a smaller one, and that its subsequent momentum is commensurate with this difficulty, than it is, in the latter, that intellects of the vaster capacity, while more forcible, more constant, and more eventful in their movements than those of inferior grade, are yet the less readily moved, and more embarrassed, and full of hesitation in the first steps of progress."

We suppose as known the principal problems touching mobile being in general and its major divisions: mobility according to place, which is the most common; mobility according to quality; and mobility according to quantity, which is restricted to animated beings. Aristotle has discussed the principles and properties of mobile being and its major divisions, in general, in the book of the Physics. The De Caelo et Mundo and the De Generatione et Corruptione study in particular the two first species of mobility. These last two works which treat of subjects, the study of which demands very circumstantial experience, and of which many of the theories remain more or less provisional, are in a great measure outdated (2) and replaced by physics and chemistry; whereas the books of the Physics, insofar as they do not resort to phenomena and to theories which depend upon subsequent treatises are impervious to time.

You are beginning at present the study of the third species of mobility, that of the animated mobile being, of the living body. And behold, the first difficulty is raised on the subject of the very title of this treatise. The word psychology signifies that it is indeed the soul, and not the living or animated mobile being, which is the object of this discourse, of this treatise. The books of the Physics had for their subject mobile being as such, the De Caelo treated of mobile body; the De Generatione et

Corruptione, of things which come into being and perish at the term of a movement according to quality, called alteration. Nevertheless the treatise on the soul studies at first onset not the animated mobile being, the living body, but resolutely that which is in short only a principle of the natural living beings: their proper and intrinsic principle which we agree to call the soul. Wouldn't it be convenient to consider and to define in the first place the natural living being in general, and then to show what is the characteristic of its form? The general properties of living bodies as such once established, those of the soul in particular would secondly be sought.

It is, however, in the inverse order that one ought to proceed, as Saint Thomas expressly affirms. The study of living things ought to start from the study of the soul in itself, and it is only in the last place that the general consideration of living things can be entered upon: "*Ultima autem ordinatur libri qui pertinent ad communem considerationem vivi...*" (3) Such is the order to be followed, and for a very good reason.

From the outset of his commentary on the *De Anima*, Saint Thomas says that it is necessary to consider first the things which are common to all animated beings; now what is first common to all animated beings is the soul: "*in hoc enim omnia animata conveniunt.*" (4) And yet, at first sight, this reason leaves a doubt. In fact, couldn't it be said just as well, if not better, that what all these species of living things have in common, is that they are living beings? Let us not forget, however, that we are here in the philosophy of nature: we are studying natural things. Now, among the latter, "there are some which are simply bodies and magnitudes, just as stones and other inanimate things; others have a body and magnitude, just as plants and animals, and their principal part is the soul--likewise it is more according to the soul than according to the body that these things are what they are." (5) Therefore, that by which living bodies are what they are, is not the common attribute of living, but that very thing in virtue of which they are living bodies and which is also the reason for which we call them, more precisely, animated things.

But that increases the difficulty. In order not to be obliged to repeat with respect to each species all that each has in common with the others, science must very reasonably treat in the first place about that which is common--as much as possible (6). We say "as much as possible" for, on the one hand science must begin with what is most known by us, and on the other hand, what is most common is not always the most known. For example, there are without doubt, some elements common to all natural beings; but in the course of history, all that the sciences have taken for elements (for the ancients water and earth, air and fire) could have always been resolved into more primitive entities, since in all strictness elements must be understood as "the things into which bodies are ultimately divided, while they are no longer divided into other things differing in kind." (7) On the other

hand, it is very necessary that this most common thing, with which a science begins, be also the most known by us. But, how could it be affirmed that, of all living beings, it is the soul which is known first, when its existence has been denied and continues to be denied by so many persons among whom are numbered philosophers and savants of renown? And wouldn't honest folk be astonished if they were told that the carrot has a soul and that this is not a metaphor?

II. THE EXPERIENCE OF LIVING

The first knowledge of the soul, presupposed to all other, is compared justifiably enough to the prose of M. Jourdain: the only difficulty here is in the word, the thing signified being known by all. It is so of the soul, as of the truth of which Aristotle used to say that in a sense knowledge of it is easy, and he cites the proverb: "Who can fail to hit a door with an arrow?" (8) Now, in certain cases, the target is as big as a door, and so close that it is necessary to draw back a little. We cannot elude altogether the method of Professor M. Jourdain.

We ought not to make a clean sweep of all that we know regarding life and the soul before undertaking the study of it; but we acknowledge without difficulty that these notions are of unequal value and in general rather badly ordered. The ideas which cause the most difficulty at the outset, are not those of spontaneous knowledge, but those which you have gathered at random in your reading or in certain courses, as from the opinions of philosophers. Thus, there is no one among you who has not heard said that the living thing has its characteristic, self-movement, and you have believed that you have grasped the truth in the comparison of the growth of the tree and the expansion of a gas, or of the horse and the wagon which he draws; and perhaps you have even received the answers to the objections which arise from the automobile. From this, you have at least retained the impression that the exactness of this definition would be uncertain as long as a Ford and a horse had not been taken apart; that the experience of biology delays its approval, and thence the very existence of the living thing finds itself compromised in the same proportion. And what will then be your sentiment when you learn that in the opinion of a reputed scholar "a solution is not satisfactory in biology" except insofar as we succeed in dissipating "the apparent abnormality of life" by "reduction to the laws of the inanimate world"? "The common opinion among tradesmen is that of having arrived at such a solution when 'the biological phenomenon studied is reduced to a series of physico-chemical processes'. But, the perfect proof of such a reduction is the quantitative verification of the laws found in inanimate nature. Therefore biology like all the other sciences tries to be as quantitative as possible." (9) Without

any difficulty one can find physicists of great renown to support this opinion.

Whatever be the value of the testimony of scholars who hold the counter-part, it is not by such a slippery road that we will grasp the living thing as a being which moves by itself. In truth, life is much closer to us, and the original notion does not wait for the permission of a science which secludes itself in what we are accustomed to call, not without equivocation, purely objective experience. The more so as the phenomena which lend themselves the best to this type of experience and to an explanation in terms of external observation, are also the most remote and the most obscure. According to a reiterated remark of St. Thomas, the life of plants is hidden and it is only among the animals that life manifestly appears.

Let us continue, then, on the detour which we have agreed to make in order to see, in true perspective, the knowledge immediately presupposed to the study of the living. How can St. Thomas affirm that the life of plants is hidden, that the life of animals is more accessible to us (10), when the plant organism is sensibly more simple than that of the living thing endowed with sensation? Is it not undeniable that the inorganic world is even more within our comprehension, whereas man, of a complexity hardly foreseen, is of all beings of nature the unknown par excellence? We would be in the wrong, however, to elude the no less undeniable fact that it is this very unknown thing which knows itself as such. This is the animal that asks itself who he is, and who is in quest of the why of his existence; this is the same animal who knows that he is the most complex of animals; and he knows himself sufficiently to be aware that he is very ignorant of himself.

A reputed embryologist, after having diminished the eminence of the human species in the Aristotelian classification, nevertheless finds himself constrained to recognize that if man is an ape, he is at any rate the only ape to debate the question to know what sort of ape he is. (11) The observation is made with as much a propos as humor: the savant, very uneasy over finding the traits profoundly characteristic of man, reassures us by appealing to an experience which is not among the customs of scholars to consider, I mean the internal experience of the fact that we ask ourselves a question, the experience that we have of the fact that we ask ourselves what it is to question oneself. This conscious operation is as real an activity, as distinct a datum as walking or eating. However little we know of the material structure required in the animal that asks itself a question and that knows that it is asking it, be this question wise or absurd, the sure fact that it questions itself is there--as much as the apes at least. Even though we should doubt that man is the only one of the animals capable of studying embryology, this would not diminish in the least the fact nor the problem; man studies embryology. And it is not probable that any organization whatsoever of the body which we study especially

through external experience, can support a similar interrogative self-examination, just as it is not astonishing that an airplane is more complicated than a wheel-barrow. (12)

The first notion of life, that to which we ought always to return, comes to us first of all and principally from the internal experience of living. To live is to touch, to taste, to smell, to hear, to see; to discern these sensations one from the other, to imagine, to remember; to love, to hate, to move oneself from place to place, to rejoice, to be sad; to comprehend, to reason, to will. Life is known by us first of all in the consciousness of the very exercise of these operations; and if the words which we use to designate these operations can signify anything for us, it is that we attribute them without difficulty to these operations which we experience within ourselves during their exercise. But the activities which occur within us, without themselves being either the acts of knowledge, or the acts of desire or of movement proceeding from knowledge, are very obscure and can only arise from external experience. I know that I know in the act of knowing this bread; I know that I want it and I move myself toward it in order to eat it, but I do not know that I digest it in the act of digesting; this vegetative activity is not within the capacity of internal experience. That is why the life of plants, limited to nutrition and propagation, is hidden. But since its corporeal organization, its parts and their functions, are at the same time visibly less heterogeneous, less complex than those which are engaged in the conscious activities of the animal, the plant will also be more accessible to external experience. In this respect, we will say that animal life is more hidden than plant life.

I see with my eyes and I sense that I move as mine this hand which I fold upon itself and that I feel touching itself. I have the internal experience of having this internal experience. I am ignorant, however, of all the very complex corporal structure that is necessary in order to see with these eyes, with these eyes which I see in the mirror. Nevertheless the life which I experience, the knowledge which I have of knowing sensible objects and of experiencing certain of these as parts of myself, as instruments of my knowledge and of my displacements, all this makes me recognize in my neighbor, in his form, in his movements comparable to mine, a life similar to that which I can only experience in myself.

It is fitting, therefore, to affirm that if we did not have this internal experience of living, all life would be totally unknown to us, nowhere would we know how to recognize it and we would not inquire about it. If we had not the experience of our own thought, the problem of the intellect would not present itself. "...We would never inquire about the intellect if we ourselves did not think; and when we inquire about the intellect, we do not inquire about any principle other than that by which we think." (13) In this internal experience of thinking about an object, we know in some manner our own intellect. "Knowing itself, it knows

also other intellects in so far as it resembles them." (14) And what St. Thomas says about the mind applies as well to the senses and to self-movement according to place. The exterior manifestations of the life of another are only recognized as vital in so far as I comprehend them as similar to my own--which I perceive through this external experience of which I have at the same time an internal experience. That is why biology which, fearing anthropomorphism, would wish to render an account of phenomena by means of purely external experience, could without a doubt progress without end in the study of the living, but it would be ignorant of the living as such, and the name of biology would be usurped. Such a biologist would be comparable to a person blind from birth who would study colors. The latter could no doubt understand optics which defines colors by their angle of refraction in a prism, but the proper sensible, color, which is the object of sight, would be unknown to him. He would know a quantitative mode of color, a common sensible; but the color which is the proper object of sight is not its quantitative mode.

III. OUR CERTITUDE OF LIFE

The critical era in which we live demands that, before any strictly scientific consideration, we lay stress upon the certitude which we have of living and of having a soul. We will not put the cart before the horse by assigning to this experience distinctions which will be imposed in the course of the treatise. Moreover, do not try to find on which faculty or on which acts this experience depends. It suffices for the moment to evoke some facts which you can recognize for certain. Well, "the science of the soul is very certain," says St. Thomas, "with regard to this that each one experiences in himself that he has a soul and that the operations of the soul are in him..." (15) Indeed, our soul as such is not the object of a direct experience which would make its nature apparent. That is why St. Thomas immediately adds: "but with regard to knowing what the soul is, this is very difficult."

Here is how our masters have designated this experience. "We are aware that we have a soul, that we live and that we are, because we are aware that we feel, that we think, or that we exercise vital operations of this kind; that is why the Philosopher said in book IX of the Ethics: '[he who sees is aware that he sees, and he who hears is aware that he hears, and he who walks is aware that he walks, and likewise in other activities we are aware of our work. So that] we feel that we feel, or we know that we know. And by that very way which we feel that we feel and that we know that we know, we feel and we know that we are. [For to be, for man, is to feel or to think.]' But no one is aware that he thinks if not in thinking about something, for we think about something before knowing that we think; that is why

the soul arrives at being aware actually that it exists, through the interpreter of the thing which it thinks or feels." (16)
"That which is per se and essentially in the soul is known by an experimental knowledge, in so far as man experiences through his acts the intrinsic principles: it is thus that we perceive the will in willing, and life in the operations of life." (17)

Let us avoid allowing the belief that the experience of which we speak is a privilege of adepts. In order to prevent any misunderstanding, let us remark that internal experience has no object directly given: the operation which we experience in ourselves is no doubt the object of this experience, but it is not an object by the same right as the object perceived through this operation. As much must necessarily be said about the knowledge which we have of our Ego in conscious activities. It is one thing to see "this white" or to comprehend that "the diagonal is incommensurable with the side of a square", it is quite another thing to be aware that "I see this white" or that "I comprehend that the diagonal is incommensurable with the side of a square." It is only in perceiving such an object that we are aware of the very act by which we are on the way of grasping it. That we turn back deliberately upon the act by which we know this white, that in this act of reflection we know, as an object, the act of knowing this white, the object of this act of reflection does not continue in the least to be the act by which we see this white. It is true that we then turn back upon this act of knowing in order to fix ourselves upon the act itself, and not upon the object of this act, but the fact remains that the act which is the object of this self-examination is never, itself, directly given. It is therefore useless to try to find a pure consciousness without any act other than itself.

Do not believe for an instant that we stop at this question to defend the objectivity of knowledge. No, let us not continue without stopping. We wish simply to make clear that the study of the soul, which is placed on the plane of the universal, presupposes as a starting point knowledge of vital activities which we experience first of all in ourselves, which we attain in singulari in internal experience. Evidently this point of departure does not make the subject of psychology. It is important, however, to see that universal natures directly envisaged in this science are no less founded on singular objects--the activities of which we are conscious--which we know solely in an indirect manner. It follows that the universal thus formed will be itself just as imperfect. It is with reason, therefore, that Aristotle tells us that "To attain any assured knowledge about the soul is one of the most difficult things in the world." (18) We see from this how grave is the error of those who believe that they have an intimate knowledge of the nature of the soul through internal experience. To believe that we know a thing when we scarcely know it, is to deceive oneself and to pass off the study of the soul for an occult science. It is because one has confused the singular objects ("intelligo", "intelligo me intelligere") which we know in an indirect manner

nce, with the abstract objects of these
 gere simpliciter") directly studied by the
 ; and what is true of the singular with what
 versal, that one can assign as the object of
 mediate data of internal experience sometimes
 called consciousness. We are the more exposed to commit the
 mistake that we have the internal experience of knowing the
 universal--I know that I know the intellect: "intellectus meus
 intelligit intelligere simpliciter", in opposition to
 "intellectus meus intelligit se intelligere". (19) Nevertheless,
 this experience does not have for its object the universal
 itself, but my singular act of knowing the universal. In short,
 when the data of consciousness are the object of direct
 knowledge, they are no longer data of consciousness, since the
 object of consciousness is always a singular known in an indirect
 way, and therefore, when they are the object of consciousness,
 they are not immediately data.

Let us remark, however, that the terms "immediate" and "direct"
 would be used in another manner if we were comparing the
 knowledge which I have of my own life in singulari, to my
 knowledge of your life. In opposition to my knowledge of your
 life, that which I have of myself is direct and immediate, for it
 is not in passing by your life that I experience my own: it is
 for having experienced first of all my own that I am able to
 recognize yours.

IV. THE INVERSE PROPORTION BETWEEN CERTITUDE AND CLARITY

The point of departure of this study is not, therefore, without
 paradox: the science of the soul is very certain because it is
 founded on an irrefragable experience, but it is difficult in the
 same proportion. "...No one has ever deceived himself in that he
 would not have been aware that he lives, which arises from the
 knowledge of the knowledge by which we are aware of what happens
 in the soul;...nevertheless, many persons are mistaken with
 regard to the knowledge of the proper nature of the soul." (20)
 "...The difficulty of knowing the soul is very great (maxima),
 and we only succeed by reasoning from the objects to the acts,
 and from the acts to the potencies." (21)

We believe that it is important to attract attention to this
 obscurity, lest, insufficiently instructed concerning the true
 fundamentals of the study of the soul, you learn some day after
 having spent much of your time upon it, that you were like the
 young people of whom it is said: "non attingunt mente, licet
 dicant ore," (22) and that you were only putting the whole in
 doubt.

However vivid our experience of living is, even when it is deliberately considered, it is all the same a poor representation. Our experience permits us to know so little about its objects indirectly perceived, that the direct objects of the operations which we experience in ourselves ("this white", "the white", "the line", "this line") tend to eclipse the first and to detour us from them as from a road without outlet. The simple repeated return upon our acts (23) would not advance us, or rather would carry us too far into a sterile infinite, as St. Augustine points out: "But if such things alone pertain to human knowledge, they are few indeed; except that they can be so multiplied in each kind, as not only not to be few, but to reach in the result to infinity. For he who says, I know that I am alive, says he knows one single thing. Further, if he says, I know that I know that I am alive, now there are two; but that he knows these two is a third thing to know. And so he can add a fourth and a fifth, and innumerable others, if he holds out. But since he cannot either comprehend an innumerable number of additions of units, or say a thing innumerable times, he comprehends this at least, and with perfect certainty, viz. that this is both true and so innumerable that he cannot truly comprehend and say its infinite number. This same thing may be noticed also in the case of a will that is certain. For it would be an impudent answer to make anyone who would say, I will to be happy, that perhaps you are deceived. And if he should say, I know that I will this, and I know that I know it, he can add yet a third to these two, viz. that he knows these two; and a fourth, that he knows that he knows these two; and so on ad infinitum." (24)

Believing that the soul fact of recognizing internal experience as a point of departure necessary to the study of life compels us to paw about the spot, many are mistrustful of it, preferring to hold fast to the so-called objective method--as if it were necessary to choose. In fact, we maintain: we cannot learn anything about the nature of vital operations, of their respective potencies or of the soul, except by reasoning from their objects. And yet never would we inquire either about the nature or the principles of operation by which we attain an object, if we did not know first of all this operation for having experienced it in ourselves.

St. Thomas has composed many articles to show that our soul does not know by itself what it is (*quid est*). (25) When, after a "*diligens et subtilis inquisitio*," we arrive finally at knowing something about its nature, we have succeeded only by way of its objects and its acts. But if it is very difficult (*maxima difficultas*) to know so little about it by such indirect means, why does St. Thomas go to the trouble of pointing out a thing as evident as that obscurity? It is a passage from St. Augustine which was the occasion for it. (26) Certain contemporaries of the Angelic Doctor believed that they were obliged to interpret it in this sense: our soul would know itself by its own essence, with an evidence at least comparable to that which we have of the

first indemonstrable principles. Among the arguments of St. Thomas, let us mention the following: "...But no one can err in things that we know naturally: for no one errs in self-evident principles: so that no one would err about what the soul is, if this soul know this by itself. But this is clearly false: since many have maintained the soul to be this or that body; some, that it consisted in number or harmony." (27)

It would be alleged that an opinion as unlikely as that which grants us an experience of the nature of the soul, ought to find its reason in sheer historic contingency: the excessive docility of certain disciples of St. Augustine, which makes them applaud even the impossible things which the letter appears to affirm at first sight. But besides, a similar opinion was attributed to Aristotle, and we find it clearly and resolutely advanced by the father of modern critical philosophy, whose "first [precept] was never to accept anything for true which I did not clearly know to be such, that is to say, carefully to avoid precipitancy and prejudice, and to comprise nothing more in my judgments than what was presented to my mind so clearly and distinctly as to exclude all ground of doubt." (28)

The definition which Descartes has left us of the clear and distinct idea is clearly such: "Claram voco illam [ideam vel perceptionem] quae menti attendi praesens et aperta est...Distinctam autem illam, quae cum clara sit, ab omnibus aliis ita se juncta est et praecisa, ut nihil plane aliud, quam quod claram est, in se contineat." (29) Well, among the clear and distinct ideas is found that of the soul: I am "a substance of which all the essence or nature is only to think, and which, to be has need of no place nor depends upon any material thing; so that this ego, that is to say, the soul, by which I am what I am, is entirely distinct from the body, and that the soul is even easier to know than the body, and that even if the body were not at all, the soul would not cease to be all that it is." (30)

This is what we conceive very clearly and very distinctly, and that in an intuitive manner, in the truth: I think, therefore I am. Is it not remarkable that Descartes apprehends as more simple and more clear those notions which the philosophers had always considered to be the most obscure and the most difficult? In the *Troisième Meditation*, we read "that in some manner I possess the notion of the infinite before that of the finite, that is to say, of God than of myself." And you know how, in the *XIIe Règle*, he disregards the Aristotelian definition of movement: "...Do they not appear to prefer magic words, having an occult force and surpassing the range of the human mind, who say that movement, a thing very much known by each one, [rem unicuique notissimam] is the act of a being in potency, insofar as it is in potency? Who, in fact, comprehends these words? Who is ignorant of what movement is? And who would not admit that these men have searched for a bow on a sapling? It is necessary, therefore, to say that things ought never to be explained by a definition of this sort, for fear of apprehending the composed

instead of the simple, but that each one ought not only to examine them separated from all the rest, with an attentive intuition and according to the light of one's mind."

In truth, there are no more evident examples of the inverse proportion between certain knowledge and clear and distinct knowledge, than the experience of living and of being, and the perception of movement; nor is there any more decisive illustration of the inverse proportion between the knowability of things in themselves and their knowability for us, than that of God. Likewise, let us indicate properly the critical turn in the history of human thought; it is completed in the identification of certainty for us with the clear and distinct knowledge of things with regard to what they are in their proper nature. God, of all beings the most intelligible in himself, and the human soul, the most knowable in itself of the things of nature, become the most known by us with regard to "what they are". On the other hand, movement, the least perfect of acts and consequently the most obscure in itself, is converted into "rem uniuersae notissimam" with regard to its very nature. Here is, therefore, a universe conceived to the measure of man. But who does not see that this clarity and this distinction are only the fruit of a confusion without equal and without hope? But if this is found already among David de Dinant or Nicholas of Cusa, at least, such a confusion had never yet been formulated with such clarity, which is apparent to some and which seduces others. To be so immediately, clearly, and distinctly perceived by us, it would be necessary that the Deity be less than human; and to be known so well and so soon by us, it would be necessary that the soul also be a mere trifle.

V. THE ORDER TO BE FOLLOWED IN THE STUDY OF LIVING THINGS

It is, therefore, because we know living things first of all through the operations which we experience in ourselves, and as our own, that we begin the study of living things by a search of the nature of the soul. The word "soul", in fact, does not signify at present anything other than the principle and the cause of the operations which consist in moving oneself, and sensing, which are very manifest as to the fact. The cause is precisely that by which bodies in which we encounter these activities, and which, for this reason, we call living, differ in the first place from other bodies. The body which has life differs from that which is deprived of it, not because it is a body, but because it is a living body. "For, in saying 'a body which has life', I say two things--namely: that it is a body, and that it is this sort of body, namely: which has life--it cannot be said that this part of the body which has life, and which is called a body, be the soul. In fact, by soul we understand: that by which that which has life lives." (31) And

that is the principle of which we seek to know the nature: what is it precisely?

You will have noticed that we have mentioned two sorts of vital operations: to move oneself and to sense. Why hold to these? Why not mention the intellect and the will, for example? So much the more since we no longer live in the time of the ancient philosophers who did not know yet how to distinguish between sensation and thought. This distinction which has been taught us since our infancy was, however, long ignored by the first thinkers. The long and laborious advance of philosophy at its beginnings is still for us a great help. In fact, first gropings put in relief, help us to see the order of things which are naturally better known and more certain for us. Well, among the operations of which we have internal experience, it is that of self-movement according to place which we know the most manifestly in the living things that surround us. "We see that animals live, as long as some movement is apparent in them." (32) As for sensation--an operation which remains in us in the measure in which it is knowledge--it is in this that we have the experience of moving ourselves, and it is during a sensation that we have the irrefragable certitude of living. But this does not mean that today we ought to rest content therein. It is not necessary to be satisfied at the beginning with what the first philosophers recognized and expressly named. It is true that under pain of turning in circles, we can never presuppose as an absolute principle something of which the proof remains to be established (such is the difference between the intellect and the senses), but it is convenient from the very beginning to draw attention to the operations which are in reality characteristic of the intellect. That is, nevertheless, what we have done in the course of the preceding.

Since the forms and the operations of the living things that surround us are of a great diversity, the souls that are their principles ought also to be diversified. And in that case, which one ought we to study first? We fear that the answer will come to us too promptly. Indeed, we have learned for a long time that science ought to proceed from the general to the particular, but we doubt whether the sense of this principle of method is always understood and whether its import is seen. There is, it is true, the reason of economy: in order not to have to repeat for each of the multiple species all that they have in common among themselves, it is better to study the communia at the beginning, once and for all. But we have already pointed out that this question is not so simple. (33) Since it is here a question of apprenticeship, it is necessary to begin with common things, yet it is necessary that the common things be at the same time most knowable for us. Furthermore, that the first data may be easier to know, it does not follow that their study and the research of the common properties to be defined and to be demonstrated will be equally easy. It is precisely in the doctrine touching upon these common things that the errors are very numerous and consequently very widespread. We get a clear idea, in studying

the Physics, that if the fact of movement is easy to ascertain and very certain, "it is difficult to see in what it consists," (34) just as modern philosophy never ceases to prove. (35) The disagreement on the most elementary notions is so radical that most of the learned men turn away from them (when they do not declare them vain) in order to apply themselves then and there to the particular: the "fundamental problem of movement" becomes, then, a problem of mechanics which begins with the law of inertia; the science of life begins, not with the study of the soul, but with cytology, the previous question being useless, insoluble, reserved to the philosophy which searches in a darkroom for a black cat that is not there--as has been said of Metaphysics. It must be admitted, nevertheless, that this process has borne some fruit. (36)

What order is to be observed in the study of the living, conforming to the method which St. Thomas calls *processus in determinando*, in opposition to *processus in demonstrando*? (37) For the reason given above, we do not consider first of all the living as such, but rather that in virtue of which it is living, namely, the soul. It is, therefore, the soul, envisaged in all its generality, according to its "*communissima ratio*", (38) that we will seek to define first. Then, "we ought not to content ourselves with the common definition, but seek the proper definition of each part of the soul...Consequently, for each species of animated being, it is necessary to seek what is its soul; in order to know what is the soul of the plant, what is the soul of man, and what is the soul of the beast." (39)

It is with a purpose that we asked ourselves what order is to be observed in the study of the "living", and not solely the soul. The treatise on the soul, in fact, is only the first part of the study of the living. In his commentary on the *De Sensu et Sensato* which is placed immediately after the treatise on the soul, St. Thomas outlines the study of the living: the Philosopher "begins the teaching of natural science by starting with that which is most common to all things of nature, namely, movement and the principle of movement: then, in the end, he proceeds by the mode of concretion, that is to say, of application of the principles common to determined mobile things, some of which are living bodies. With these he begins again the same procedure, dividing his study into three parts: in the first, he considers the soul in itself, as if he were studying it in an abstract manner; in the second, he studies the things of the soul in a concrete manner, that is, through the mode of application to the body, but by adhering to the generalities; in the third, he applies all these considerations to each species of animals and of plants, by determining what is proper to each species. The first of these studies is contained in the book *De Anima*; the third, in the books which he wrote on the *De Animalibus et Plantis*. (40) With regard to the intermediate study, it is found included in the books which he wrote on the subject of things which belong commonly either to all animals, or to several genera of animals, or even to all the living: this is

the object of the present treatise." (41)

What is this "abstraction" of which St. Thomas speaks, and in what does this process from the common to the particular "through the manner of concretion and application" consist? This is the problem of which we were thinking in remarking that we doubt that its meaning is always understood. In fact, the opinion has been successfully spread abroad that scholastic philosophy is a "concept game" which consists in drawing, by means of a confusion of syllogisms (in Barbara, as often as possible), the very particular concepts from the more general concepts; a dry deduction, they add, which could not be reunited to living reality. (42) It would be desired, in our opinion, that these very general notions with which science begins contain the more particular notions in such a way that it would suffice for the intellect to apply to them its reasoning in order to bring out the latter with all that they have most properly. Thus it is that from the common notion of the soul it ought to be possible to deduce strictly the souls of all species. That a certain pseudo-scholastic type has founded this rumor is possible. Among the masters nothing similar is found. The contrary is even found among them. By a strange trick, it is among those very modern philosophers so much admired by the authors who contemptuously treat the so-called "conceptualistics" of the Aristotles and Thomases, that we encounter this idea, pushed to its limit. This is what we will see in an instant. But we will express first of all in Thomistic terminology this false method which is passed off as our own. We will profit from it in order to show in what the process of concretion consists.

VI. THE PROCESS OF CONCRETION IN THE STUDY OF LIVING THINGS

The process in *determinando* (43) is the order which we follow in the consideration of the different subjects and principles of a science insofar as they are more known by us. Now, that which is most known by us and more certain is the confused. Thus it is that we notice first of all that this object is a figure, that it is a closed curve, and finally that it is an ellipse. Likewise, man is known first of all as an animal. We find this order, as much in intellectual knowledge as in sensible knowledge. As long as we know the ellipse solely as a figure or as a closed curve, we do not distinguish it from the other species of figures, or of closed curves; as long as man is not known in that which distinguishes him from the beast, our knowledge is confused. But this confused knowledge is also more common, more universal: for the polygon is equally a figure, the circle is a closed curve, and the horse is an animal. Likewise, in science, we consider things according to that which, in them, is first of all more known, to go thus by degrees toward that which is more knowable in itself: for, manifestly, man is more knowable in himself than

animal, being animal and reasonable, he is more distinct, more in act and consequently more knowable in himself. (44) We are advancing then from subject to subject following this order of community. In the science of nature, we try to know in the first place what is proper to a thing insofar as it is mobile, then what is true of it with regard to its mobility according to place, etc. A last term of all this process would be, for example, the study of the characteristic gait of the elephant. Certainly, it would be impossible for one man to embrace the vast domain which separates the consideration of the mobile being and that of the flight of the dragonfly: that is, all the natural sciences. Moreover, each of the multiple natural sciences which already have to borrow from the field of the others, can extend indefinitely in its own bosom. Such would be, nevertheless, the order which he would have to observe in order to have a well ordered overall view.

The process in *demonstrando* (45) also, is determined by the principle that we ought to go from the more known to us to the less known. But it differs from the first by the order which we follow in the research and the demonstration of the properties of a given subject. In the process in *determinando*, we go from the less determined subject to a more determined subject: we seek to know first of all the nature and the properties of the soul in general, and then the nature and the properties of its different species: whereas the process of demonstration is the order which is followed in the acquisition of the scientific knowledge of a given subject. While the first process is common to all the sciences, the second can vary from one science to the other and even according to the different parts of one science. Thus mathematics and the physico-mathematic sciences demonstrate through the formal cause alone (46); natural science applies itself, besides, to knowing things by that of which they are made, by that which makes them, and by the good which moves the agent to produce them. The entire book II of the *Physics* is consecrated to this part of the general method of the study of nature which we call the process of demonstration, but each treatise will have besides its particular procedure. Thus it is that in mathematics, where the most known by us can, from the point of view of demonstration, be identified, in principle, to the most known in itself, the demonstrations will be *a priori*: the reasons given by us are at the same time the first reasons in themselves. But in natural science most of the proofs remain *a posteriori*. (47) The first demonstration which you will learn in the present treatise is precisely of this sort: the soul is the first act of a natural body endowed with organs, because it is "that by which" and "primarily", we live, feel, move and think. The process in *demonstrando* consists, therefore, in no wise in bridging the gap between the different subjects of the process in *determinando* as if, from the nature and the properties of the soul envisaged in all its generalities, the nature and the properties of its species were able to be inferred. There is, therefore, no cause to attribute to ourselves an Hegelian method, which confuses the two processes.

The process in determinando is at the same time a process of concretion. The universal, in fact, taken in the sense in which we understand it in the present process, is compared to the particulars of which it can be affirmed, like the abstract to the concrete, like "movement" to "local movement". At the beginning--that is, as long as we are still in the general and confused--we are far from the determination, from the perfection, from the knowability proper to things. Through an abstraction of this kind, our knowledge is very poor, and it is by going gradually toward the specification of objects, toward their ultimate distinction, their concretion, that science is enriched. "In natural things", says St. Thomas, "nothing is perfect as long as it is in potency; a thing is absolutely perfect when it is in ultimate act; in the intermediate state between pure potency and pure act it is not absolutely, but relatively perfect. Likewise for science. Now, the science which is had of a thing only in general is not a complete science according to the ultimate act; it is something intermediate between pure potency and ultimate act. For he who knows a thing in general actually knows something about that which is the proper reason of this thing, but the rest, he knows only in potency. Likewise, he who only knows man insofar as he is animal only knows in act one part of his definition, namely the genus: the constitutive differences of the species, he does not as yet know in act, but only in potency. Whence it manifestly follows that the complete science demands that we do not stop at generalities, but that we proceed to the species..." (48)

The proper being of things is, then, their ultimate difference, which attracts us and which liberates the intellect from this indetermination of the universal. Science being the perfection of the intellect that seeks this perfection, one naturally wishes to know what makes a beaver a beaver; what makes a man, man, with regard to all that distinguishes them from all other things, body and soul. It is the author of the *Metaphysics* and of the *De Anima* who wanted to know why dogs run obliquely. He did not rest content with mobile being, nor with animated body, nor with the beast, nor with the quadruped. And in this the process of concretion consists. It is, therefore, in this direction, so scorned by a certain type of philosophy, that the perfection of science is found, as St. Thomas says when beginning the study "of shooting stars, comets, rain and snow, lightening, earthquakes, et alia hujusmodi."

VII. THE TWO GENERA OF UNIVERSAL CAUSES IN THE STUDY OF LIVING THINGS

In this process of concretion, of the relation of the universal to the particular of which we have just spoken, is added another

which is in some way the inverse of the first. The more the process approaches the distinct knowledge of the particular, the more do we approach that very way to a universality which, in distinction to universality in praedicando, is such [i.e. universal] by its actuality, by its extreme determination which embraces the multiple in its variety and its distinction. The perfection of our knowledge of the universal in causando will depend on the degree of distinction according to which we will know the particular.

Let us remark first of all that if, from the point of view of predication, the species is the subjective part of the potential whole which is the genus, from another point of view, that of the distinct knowledge, the relation of the universal to the particular is in some way inverted. The species, in fact, is in itself an integral whole which contains the genus as a part. Thus it is that man, who can be called animal, is more than an animal; he is moreover reasonable, and in this regard he is a whole intrinsically constituted by those parts: animal and reasonable. As long as we do not grasp distinctly these actual parts, knowledge of the integral whole remains confused, like that which we have of the subjective parts of a potential whole. (49) But from that moment when we know them in a distinct manner, we grasp precisely this relation upon which the species is more common than the genus. What, in the first perspective, was envisaged as a whole is now a part; the particular includes the more universal et amplius: "secundum quod minus commune continet in sui ratione non solum magis commune, sed etiam alia: ut 'homo' non solum animal, sed etiam rationale". (50)

A number of modern philosophers would conclude from this that here, then is a part greater than its whole; so that the principle of contradiction itself would be set aside. Yet, as we have indicated, it is a question of totally different relations. In effect, the unity of the genus which we predicate of man, of horse, of the bee, etc., is purely logical; the predicable genus animal has its form and its unity from reason which can abstract from the differences, without which, nevertheless, it is impossible to be, in reality, animal. There is not, therefore, in nature, in addition to the form by which man is man, and that by which the horse is horse, a common form by which the different species of animals would be animals. The form by which man is man, is at the same time the form by which he is animal, and it is by its form of horse that the horse is animal. (51) Hence, to know the animal distinctly is to know it insofar as it is man, or horse, or bee, etc. The universal whole which is the same genus animal does not contain its parts in act, but only in potency, and this is the reason why they are called subjective. But if we said that it contains them in potency and that the potency is a potency for an act, we would point out that potency in cause is defined precisely in the line of predication in which the predicable is like a form in comparison to all that of which it can be predicated. (Thus, in the attribution: man is an animal, or: the horse is an animal, man and horse are subjects and animal

is the form.) In effect, from the point of view of the things signified, this genus is founded upon the natures and it is posterior to these; it is in the natures distinct according to their ultimate form that actuality is found, but never in the genus which owes its unity and its universality to the abstraction from this actuality. As soon as we consider animal in the species, it is no more than a part of a more comprehensive whole. Thus, the species is not in any way an elaboration of the genus.

But, shall we say, the genus which is found thus surpassed, being no longer a form, but a subject--since man, for example, is an animal by his form of man--is no longer, in this regard, the predicable of other species; we have from that moment, notwithstanding, abandoned more comprehensive universality which expresses the unity of innumerable species. It will be added, perhaps, that science ought precisely to surpass the particular, in order to go towards an ever greater universality, free to return to the particular to view it from above as a restricted concretion of the universal--a participation.

We have not arbitrarily chosen this objection. It is fitting to pause here in an introduction to the study of the soul. In the first chapter of his treatise, Aristotle points out that "we must be careful not to ignore the question whether soul can be defined in a single unambiguous formula, as is the case with animal, or whether we must not give a separate formula for each sort of it, as we do for horse, dog, man, god (in the latter case the "universal" animal--and so too every other "common predicate"--being treated either as nothing at all or as a later product)." (52) Now, in this regard, St. Thomas recalls that in fact "the Platonists affirmed the existence of separated universals, that is to say of forms and ideas which were, for particular things, causes of their existence and of knowledge (which we have of them); for them, there existed a separated soul, a soul in itself, which served as cause and idea to the particular souls; from this soul came all that we find in these particular souls. According to the philosophers of nature, on the contrary, universals were only particular substances, and the universals were nothing in reality. Thence the question: is it necessary to seek only the common notion of the soul, as the Platonists said, or the notion of this soul or of that soul, as the philosophers of nature said, namely, the soul of the horse or of the man or of the God? (Aristotle) says "of God", because of the belief of those philosophers in the divinity of celestial bodies which they said were animated." (53)

Consequently, according to the conception of the Platonists, the definition of the soul in general should signify at the same time the very perfect and universal cause of all the species of souls. So that, to the question: who makes shoes? the response: the artisan, would be more pertinent than the response: the cobbler. "Artisan" should signify more, it seems, since it can equally be affirmed of the tailor, the mason, etc. There is, therefore, a

cause higher, anterior and universal, whereas the cobbler is only a particular cause, proximate and proper. But, doesn't it follow that the knowledge of the reason of things becomes deeper in proportion as we rise to a more confused generality? Indeed, the doctrine in question was not so simple, and the Platonists would reply easily that the indetermination in which this generality leaves us comes from the darkness of an intellect imprisoned in the body.

We ought without doubt to inquire about the causes higher, anterior, and universal, as much as possible. But if more often we should not know how to grasp them, yet it is necessary to be aware of them. Be this as it may, we should take upon ourselves the inverse direction of that which we have just described. In fact, the expressions "cause higher", "universal", "proximate", etc., are fundamentally equivocal. Thus it is that "artisan", in comparison to "carpenter", is an anterior cause, higher, universal, in the logical order, according to predication, but not according to causality. (54) In the example given, universality only expresses the indetermination of our knowledge of the cause. In reality, it is the proximate cause, the art of the carpenter, which is the primary and supreme cause in the order given. (55)

When we affirm that science ought to seek to know things through their primary, supreme, ultimate causes, it is manifestly not a question of causes which are such in the order of predication, which causes leave us in confusion with regard to the proper nature of things. Nevertheless, in rejecting the apparently easy conception of the Platonists, we must not abandon at the same time the search for causes which are universals in the very line of causality. For we have not deceived ourselves in affirming that such causes exist and that in them we will have a more perfect knowledge of particular things. Thus, the art of the tailor is a particular cause and first in a given order. But why this art? Why these garments? Why doesn't nature clothe us? We will find finally the primary reason in the intellectual soul which "as comprehending universals, has a power extending to the infinite; therefore it cannot be limited by nature to certain fixed natural notions, or even to certain fixed means whether of defence or of clothing, as is the case with other animals, the souls of which are endowed with knowledge and power in regard to fixed particular things. Instead of all these, man has by nature his reason and his hands, which are the organs of organs (De Anima iii), since by their means man can make for himself instruments of an infinite variety, and for any number of purposes." (56) This cause may be called universal according to causality, not only because it is the determined cause of all the intermediary causes up to the garment, up to the art which conceives it and produces it, but because it is still that which is the cause with regard to the art of the cobbler, mason, carpenter, etc. Insofar as man is in some way the end and the principle of all the arts, he is, in this respect, a universal cause. Likewise, when we demonstrate that in nature "omnia alia

praexistere, sicut quadam instrumenta, et praepraeparateria ad intellectum, qui est ultima perfectio intenta in operatione naturae", (57) we recognize in the human intellect a universal final cause.

Still, the perfection with which we will know such a cause will depend always on the degree of distinct knowledge which we have of things with regard to which it is a universal cause. This means that in the knowledge of this cause there will be for us degrees of endless perfectibility. St. Thomas was able to write the words which we have just cited, without, however, teaching a doctrine of evolution. (58) Doubtless we will never know the fundamental and universal laws which command the process of organization of the matter in view of the intellectual soul. Nevertheless, we can know in a general way that those laws exist; that man is the good, the universal and very precise final cause of the whole cosmos, of all the vegetal and animal proliferation, however difficult it may be to see it in a concrete manner. What is Andromeda doing here; the hippopotamus; the fly; and innumerable species which we would never have known; to say nothing of the clod of earth--poor relative of astronomy--awkward sine qua non for the astronomer. General knowledge of a very precise reason in itself is immediately the occasion for precise questions, some of which are fruitful, but others embarrassing like the remarks of an enfant terrible. Those latter were the most successful sophisms of history. In this regard, it is fitting to recall the proverb: fools shouldn't see things half-done.

VIII. THE INTERMEDIATE CHARACTER OF OUR SCIENCE

Have we distinguished the two genera of universality to exclude from science the universal in praedicando? Not in the least. Not only is it essential to the order of apprenticeship and to the state of imperfect science, but it is necessary to all human science however perfect it may be. In fact, when it is a question of a science properly so called--of a certain knowledge through causes--the progress of this science according to the process of determination will not consist in substituting the new for what had been previously established. Besides the fact that the general definition of the soul, for example, will not change in the course of the treatise, the universality of the predication remains essential to the unity of our science. In fact, although the universal in praedicando does not exist in things, it is nevertheless founded on them and what we say of the soul in general is true of every soul in particular: it is true that the rational soul is the first act of a body furnished with instruments, and that it is true also of the soul of the cat. Consequently, if it is necessary to attribute to our intellect the confusion in which the general definition of the soul leaves us with regard to the different species, it remains nonetheless

true that this definition expresses in a relatively distinct manner what the different species have in common, and what separates them from all other things. Let us suppose that we were treating in an isolated manner of the different species, not only would we have to repeat often the same things, but also we would have to know that we repeat them. Now, although the natures of which we say the same thing are not the same in virtue of a common natural form, distinct from that by which man is man and cat, cat, we can however grasp what they have in common only by means of such a universal. (59) On the one hand we cannot grasp simultaneously in one and the same concept many distinct objects except at the expense of distinct knowledge; on the other hand, we cannot consider the unity of many objects except by grasping them simultaneously. For it is one thing to have a distinct knowledge of many objects, which is developed in a successive consideration, and quite another thing to have the simultaneous consideration of the same objects by means of one single concept. From this is seen the intermediate character of our science which always wavers between the confused universal of which it cannot rid itself, and the universal in causando which it never seems to grasp completely. It will not truly be free excepting if the latter were at the same time at the beginning of our knowledge; if that which is most actual things were also most known by us.

"It is now evident," says Aristotle, "that a single definition can be given of the soul only in the same sense as one can be given of figure. For, as in that case there is no figure distinguishable and apart from triangle, etc., so here there is no soul apart from the forms of soul just enumerated. It is true that a highly general definition can be given of figure which will fit all figures without expressing the peculiar nature of any figure. So here in the case of soul and its specific forms. Hence it is absurd in this and similar cases to demand an absolutely general definition, which will fail to express the peculiar nature of anything that is or again omitting this, to look for separate definitions corresponding to each infama species. The cases of figure and soul are exactly parallel; for the particulars subsumed under the common name in both cases--figures and living things--constitute a series, each successive term of which potentially contains its predecessor, e.g. the square the triangle, the sensory power the self-nutritive. Hence we must ask in the case of each order of living things, what is its soul, i.e. what is the soul of plant, animal, man? Why the terms are related in this serial way must form the subject of the later examination." (60) But it is only at the end of the Metaphysics, well beyond the treatises of natural living things, that he will determine the cause absolutely first and universal in causando.

IX. THE SO-CALLED "CONCEPT GAME"

Now let us face the problem which is presented to us in speaking of a so-called "concept-game" which pretends to suffice for itself--a procedure manifestly contrary to the method taught by Aristotle, as well as to that which he followed in all his works, of which the major part treats of natural things. How is the movement of concretion directed toward its term? In what does this "mode of application of the common principles to determined movables, some of which are living bodies", consist? Is it a medium by which starting from common principles we would infer the determined movable beings? We would say yes, if the process of determination were identical with that of demonstration; if their mode of going from the most known to the less known were the same process. In this case, to apply the common principles would consist in inferring the determined moveables: from the common notion of the soul the particular notions of the different species would be inferred. Now that is manifestly absurd. Nothing is demonstrated of local movement as such through the demonstrations which deal with movement as such; it is not the demonstration which makes us pass from one to the other. What can be demonstrated of movement as such is true of local movement insofar as it is movement, but not insofar as it is local; what is demonstrated of the soul as such, is true of the intellective soul, but not precisely insofar as it is intellective. There is only one single way of passing from one level of concretion to the other, that is the constant return to the experience more and more detailed. If a phenomenon can be inferred a priori which experience has just confirmed, we have nonetheless remained on the same level of concretion.

We were just now finding fault with the philosophers who, disdaining the specificity of things, reserved for themselves and delight in the confusion which they are indeed obliged to charge with emotion, lest the void be unmasked. It must be regretted that it becomes less and less possible for one man to pursue natural science in an exaggerated concretion (for quite some time now the exigencies of specialization isolate the learned, one from the other), and yet it must be avowed that ignorance of the humblest detail in nature is a void in our knowledge of being. But at the same time one sees the irremissible narrowness of him who, reassured by the fact that his enclosed field is in its own way without limits and that he can succeed therein, would claim that the sole study of some particular aspect of things suffices for him. In fact, such a savant would not know this particular thing with a truly distinct knowledge; his confusion as yet better masked, would be no less than that of the lover of empty forms. The men who, during the last war, have attempted the most atrocious experiments on their neighbor were savants of international reputation. We are indignant about this. Yet, there was nothing in the field of their specialty to prohibit it--they had their scientific curiosity. The affair is all the more sad, they say, as these experiments did not give positive

results. However, from the strict point of view of physiology, this remark is not scientific enough, for, had it not been by eliminating one hypothesis, these curious savants behaved as scientists. Even the psychiatrist and the psychoanalyst who tried to class the type of perversion in question would not be able to tell us, without leaving the domain of their competence, why it is not fitting to be perverse. In a civilized world, human "dignity" and "decency" are not reassuring when there is left undetermined the question of knowing whether tomorrow it will be as if we had never existed. It is a problem which we ought to discuss and which we would not be able to discuss except at the level of generality very anterior to that of physiology, and where the first but inevitable notions are still among those which we willingly qualify as "vulgar".

By that we do not understand that before applying oneself to the study of things at a given level of concretion, we ought to have passed through all the superior degrees of generality--which become less and less possible as we approach the distinction of things. If, for example, we formed the simplest design of exhausting first of all the domain of experimental physics, we would never arrive at the study of life. The man of learning who would enclose himself in the fields of experimental biology, who would abstract even from his internal experience of living (an impossible thing, no matter what is said about it), would speak about life as a blind man who would believe that he knows colors because he knows how they are measured. We must, no doubt, attribute to the possibility and facility of overstepping certain essential problems (but of an order of generality disconcerting for those who would right away meet with the concrete) the situation which elicits cries of alarm from those rare savants who, without knowing how to take it, are kept sensible by the man who would not presume to forget a certain science. Maybe even in the spheres of disinterested research we have already reduced the "risible animal" to a fertilizer of superior quality.

X. ABSTRACTION IN THE PROCESS OF DEMONSTRATION

Till now we have employed the term abstraction in the sense of generality. This is the sense in which it must be taken in speaking of the process of determination. But once it is a question of the process of demonstration, this term acquires another meaning. In fact, when we say of mathematics that it is abstract, we do not mean that it is general, or of a degree of generality which would be proper to it. We understand by this that the object upon which its demonstration bears--magnitude, number--is considered by it without the sensible matter to which it is tied in the experience which we have from our senses. The

mathematical line abstracts from the line which is a common sensible, it disregards the visual or tangible object which we first call a line. It is abstracted from it, but not in the manner of which the potential whole abstracts from the differences of its subjective parts. The geometric line is not that which would be divided into chalk lines, wood lines, etc., or into white lines, red lines, etc.

Without a doubt, the sensible line, which can be divided into multiple species, is abstract, just as in their term each of these species, since they can be predicated of such and such an individual line. But, what all these sensible lines have in common, is not simply to be abstract wholes and predicable of their inferiors--either as a genus, or as a species, up to the ultimate species; it is also to be abstracted from individual sensible matter, the one as well as the other, and to be from that moment definable. By this they have an actuality which cannot be attributed to the simple fact of being wholes predicable of their inferiors. It would, in fact, follow that the most potential among these wholes, the sensible line, would be at the same time the least potential. But, we have seen that it is not that which we know according to the confused universal, but what we know according to the determined species, which is, in itself and according to nature, the most knowable. In abstraction according to generality, the abstract is form, it is true, but it is form in the line of predication only, and thanks to the potentiality of the universal in praedicando, for man is more actual in himself than animal, and animal more actual than living body; likewise, visible line is more actual in itself than sensible line. In the abstraction of which we are speaking at present, the proportion is inversed: sensible line is intelligible in act, whereas this sensible line is intelligible in potency only. Also, this abstraction is characterized not by the generality of which it could admit, nor even by the soul fact that it neglects the singular insofar as it is an inferior from a universal, but formally by this that it disregards the sensible singular insofar as it is only intelligible in potency. (61) This abstraction will be from that moment common to everything that we define with sensible matter: whether it is a question of lines, of animals, or even of the soul.

Let us return now to the geometric line. Manifestly, the abstraction which characterizes mathematics is not that of generality. The line is not called mathematically abstract because it is divided into finite and infinite, into straight and curved. All these subjective parts are equally abstract, not only insofar as they are potential wholes divisible into species or into individuals, but insofar as the one as well as the other is defined with sensible matter. And in this mathematical definitions differ from natural definitions. (62) When natural science is abstract in opposition to the intelligible in potency, the mathematical sciences are abstract in opposition to an intelligible in act which cannot be defined without sensible matter. There is, then, between the two a radical irreducible

difference.

But there is even a sense in which, in comparison to mathematics, natural science is not abstract. Indeed, although quantity cannot exist separately from sensible matter, the intellect can, however, conceive and define it without sensible matter and consider apart what cannot be apart. This abstraction characteristic of mathematics is founded upon the proper nature of quantity. [Being the] Order of the homogeneous parts of a substance, quantity is anterior to sensible qualities. We cannot conceive quantity without the parts of which it is the order, but we can conceive it without the sensible qualities which presuppose it, just as we can conceive it without the common sensibles which are modalities of the proper sensible and which are perceived through the intermediary of this latter. At the same time that we abstract from sensible qualities, we abstract simultaneously from the common sensibles. On the other hand, being of its very nature the act of matter, natural form cannot be considered absolutely apart. And to the objection that we can very well consider also a sensible quality without the others (e.g., color without sound), we would have to answer that we would not know how to consider this quality without sensible matter.

It is true that sensible quality can be considered insofar as it is a quality, but this consideration is either dialectical or metaphysical. It is dialectical as long as we do not see determinately, either the impossibility of a quality without sensible matter--which would make every quality a natural object--or the existence of such a quality--the consideration of which would arise from the metaphysical. Forming an analogous concept through the comparison of the two kinds of qualities, we could then consider in a positive manner the sensible quality as quality. As long as we would not have established the reality of such a quality, the generality of the notion of quality would only be logical, negative. For there is quite a difference between not seeing that a thing is impossible and knowing that it is really possible. But when this dialectical plan would have been surpassed, the consideration would be strictly metaphysical. (63)

From this it is seen that only mathematics can consider separately a form which could not be separated, this form being nothing other than quantity. For this reason mathematical abstraction is called formal in a sense entirely its own. Thanks to this abstraction, quantity has for us an intelligibility which permits us to establish its properties with an incomparable precision. (64) However, demonstrations will be true only of the abstract quantity envisaged formally as such.

If we have taken the liberty of recalling summarily an element of the problem of the formal diversity of the sciences, it is because St. Thomas attributes to the study of the soul an abstraction which is not of a nature to simplify things.

XI. ABSTRACTION AND CONCRETION IN THE STUDY OF LIVING THINGS

We have seen why, instead of beginning the study of living things with the living in general, it is necessary to consider first the soul--the principle "in virtue of which that which has life, lives". However, the rule of the process of determination applies all the same: "Ab universalibus ad minus universalia proceditur". From the most general from the most abstract we ought to pass to the consideration of the particular which, in the order of predication, is compared to the general as the concrete to the abstract. We study the "communissima ratio" of the soul, before considering the different species of the soul. Now, even from the point of view of concretion, the treatise on the soul will have something characteristic. In fact, it is not by pursuing the division of the soul in its species that we could ever attain living things in their specific concretion. The natural living thing is a mobile being, the animal is a living thing, an elephant is an animal; but the natural living thing is not a soul, an animal is not a sensitive soul, nor is the soul of an elephant and elephant. In the study of living things, the concrete application of which, from the treatise on the soul proceeds gradually toward the treatises on the animals and the plants, does not consist in a simple transition from the general to the particular. In the first treatise, we study the soul in an abstraction which is in no way whatsoever expressed by generality alone.

Let us return to the first lesson on the *De Sensu et Sensato* in which St. Thomas remarks that in the treatise on the soul we consider the soul "quasi in quaedam abstractione", that this consideration "est de anima absolute", and that only in the last place will we pass to the consideration in its totality, "quia ista consideratio maximae concernit corporis dispositionem". (65) Does this mean that we exhaust first the questions touching upon the soul considered separately from the body, in order then to aim our attention at the body and, finally, at the relation of the soul to the body? This manner of apprehending, besides the fact that it presumes the possibility of regulating the questions of the soul by holding fast to the soul alone, has the inconvenience of causing the belief that the soul, a natural form, is by itself an absolute object or at least separable from every reference to the body, and that it is moreover a first and direct datum of experience. That is contrary to the notion of the soul as much as to the manner by which we arrived at it. Indeed, when we hold fast to those things which we easily recognize as vital, "it therefore seems that all the affections of soul involve a body-passion, gentleness, fear, pity, courage, joy, loving, and hating; in all these there is a concurrent affection of the body. In support of this we may point to the fact that, while sometimes on the occasion of violent and striking occurrences there is no excitement or fear felt, on others faint and feeble stimulations produce these emotions, viz.

when the body is already in a state of tension resembling its condition when we are angry. Here is a still clearer case: in the absence of any external cause of terror we find ourselves experiencing the feelings of a man in terror. From all this it is obvious that the affections of soul are those of forms engaged in matter. Consequently, their definitions ought to correspond, e.g. anger should be defined as a certain mode of movement of such and such a body (or part or faculty of a body) by this or that cause and for this or that end." (66) With regard to the very notion of the soul, we define it: the first act of a natural body furnished with instruments. Being a natural form, it is an act of matter. But, "although matter is not a part of the form, nevertheless matter, without which the intellect would not be able to conceive the form, ought to enter into the definition of the form. Thus it is that we put organized body in the definition of the soul." (67) Although it embraces the body by right of "pars definitiva", the definition of the soul is not the definition of the living thing, of the composite of the body and soul, but of the soul alone; it is natural however, since, contrary to abstract definitions of mathematics and of metaphysics, it involves sensible matter. We can just as well say we are ignorant of the soul in the measure in which we are ignorant of the body of which it is the first act. (68)

The mode of defining the soul and the things of the soul always differs, then, profoundly from that of mathematics, which is absolute and abstract. In fact, although in reality quantity cannot be separated from sensible matter, we can nevertheless define quantity without matter in order to consider it in an absolute manner. (69) On the contrary, the spiritual soul, that can exist separated from all sensible matter, cannot be defined without matter. Well, if in the present treatise, in which we have not considered as yet the "*communia animae et corporis*", (70) the definitions are nevertheless natural, how can we say then, according to the expression of St. Thomas, that it deals with the soul in an absolute manner? So much the more that in the *De Anima* this abstraction which is proper to mathematics is expressly excluded. (71) This is why St. Thomas precisely states that in the study of the soul we consider the soul: "*quasi in quaedam abstractione*".

A definition of the soul or of the things of the soul which would not include natural matter would be insufficient and solely dialectical. Likewise the abstract definition of the passion of anger: the desire of revenge, is purely formal, when this affection of the soul is inseparable from matter. But, it is of no consequence to know whether this desire can exist in a pure spirit: the definition in question is dialectical insofar as it is the definition of a form which could not be considered in itself absolutely without ceasing to be what it is. "Indeed, for every form that is in determined matter, unless the matter is included in the definition, the definition is insufficient: now this form, namely 'the desire of revenge', is a form in determined matter; also, since the definition does not include

matter, it is evident that the definition itself is insufficient." On the other hand, the definition: "the effervescence of the blood around the heart", is natural, although imperfect. Let the latter be added to the first, and we will have an entirely natural definition. (72) It will be more natural than that which assigns only the matter, for the form which is in the matter is more natural than that matter itself. (73)

XII. THE TREATISE ON THE STUDY OF THE SOUL AS "HISTORY"

The study of the soul is not abstract, neither in the mathematical sense nor in the dialectical sense: it is strictly natural. But then, why attribute to it an abstraction contrary to the concretion of treatises which deal resolutely with the living thing? The reason for it is that if the soul cannot be defined without natural matter, this definition is no less the definition of the soul, and not of the matter of which it is the act. But if the passion of anger is not in the sole form "desire to be revenged", for, even according to thought, this desire, with regard to that which makes it the passion of anger, is inseparable from some affection of the body, neither is it in matter alone. We shall be able sometimes to consider principally this formal part, leaving the corporal affection in a relative indetermination. This abstraction is possible to the extent in which the soul is not entirely immersed in matter and does not have all its concretion in the body. (74) Doubtless, knowledge of the formal part will be imperfect to the extent in which we are ignorant of its matter, but it will be natural and true when we recognize the form as being that of determined matter, even though we should ignore what this matter is precisely. Thus it is that the imagination can be recognized--the sense through which we know experienced things even in their absence--as a sensitive faculty and consequently inseparable from a determined corporeal organ, without knowing what this organ is precisely. That is why it is necessary that the present treatise, dealing principally on the formal part of natural living things and of their operations which we know first by means of internal experience, considers the soul "quasi in quaedam abstractione". (75) Although we do not make abstraction of the organized natural body, we do not as yet apply ourselves to the study of nature, nor to seek the particular structure and the particular function of such and such an organization. (76)

The process of concretion of which we were speaking above was entirely in the transition from the more universal to the less universal, from the common to the specific, by means of a constant return to a more and more detailed experience. We recognize this movement in the midst of the study of the soul: the research of the different species of sensation and of the

passions require a more detailed examination of the data of internal experience, than that of the sole general notion of sensation or of passion. It will be the same for the study of the organs and of their functions: it will lay stress principally upon external experience. However, when St. Thomas says that after having studied the soul "as in an abstraction...the things which belong to the soul are considered according to a concretion or application to the body, but still in a general way" (this is the case in the treatise *De Sensu et Sensato* which immediately follows the *De Anima*), we clearly see that the term of concretion ought to be understood in a more precise sense than that of the transition from the general to the particular. It is not simply a question of a comparison of the abstract and of the concrete according to the order of predication, but of the soul which in its proper nature is related to a living body as being that by which the latter lives and by which it is such a living being. Having studied, as in an abstraction, the nature of the memory, it will be necessary to try to know which are the animals that are endowed with it, what is precisely its corporeal instrument, how and of what it is constituted, how it functions; and the desire of perfect science would incline us to seek the difference, even as regards the organ, between the memory of elephants, and that of bees.

Let us beware, then, of believing that in an abstract study we pretend to determine everything that concerns the soul, as if it were a complete nature and had all its concretion in itself; as if we were able to consider it separately from all natural matter as we do in regard to mathematical objects. On the contrary, it is precisely the indetermination with regard to the soul itself in which abstract study leaves us how ever far we push it, which urges us to study the natural matter with which the soul forms a completed nature. Although the human intellect is not the act of any part of the body and we cannot consider it through concretion or application to matter, nevertheless, all ignorance of the nature of the senses and their organs results in an ignorance concerning this intellect. In order to fully comprehend the latter, it would be necessary to know very precisely the nature of the sensible faculties--and this involves the whole composition of the body--which come into play in order that the intellect may know. Indeed, it is not any imagination whatsoever, nor any common sense whatsoever, nor even any touch whatsoever, which are apt to serve the mind. Also, he who does not know exactly what and why such sensible potencies and such organs are necessary to the intellect, is ignorant of the latter in the same proportion. Not being the act of an organ, the intellect has its concretion in the soul; but this very concretion will be obscure to us in the measure in which we are ignorant of what are the organs appropriate to the sensible potencies, which the life of the intellect demands. It is only in the substances naturally separated from all matter that the intellect is absolutely abstract and consequently completely knowable in itself. (77)

Although concretized in the body, sensation depends more upon the soul; and the more the operations and the potencies depend on the soul the more they are capable of being studied abstractly--which does not mean that this study is easier for us. It is for this reason that the treatise *De Sensu et Sensato*, immediately follows that of the soul: "But because it is necessary to pass through more similar to dissimilar things, it seems reasonable that the order of these books be the following. After the book *On the Soul*, in which we determine what the soul is in itself, immediately follows the *De Sensu et Sensato*, because sensation itself pertains more to the soul than to the body. After it comes the book *De Somno et Vigilia*, which imply the hindrance and the liberation of the sense. Then come the books concerning locomotion, which deal more intimately with sensible being. Finally, the books having reference to the common consideration of the living thing, because this consideration especially concerns the corporeal disposition." (78)

Is this to say that the conjoined corporeal organization is indifferent in the measure in which the potency and operation are more perfect and belong more to the soul? The rudimentary experience of the most observable aspect of the external senses teach us quite the contrary--let us only compare the eye to the skin. The superior living things have more heterogeneous corporeal structure. Thanks to this heterogeneity, the body itself pertains more to the soul and serves for a life more unconstrained by matter. The heterogeneity of the organs is in some way the corporeal expression of the measure in which the soul conquers matter and is transcendent to simple corporeity. Now, we can only know determinately this enterprise of the soul upon the body by studying the latter in its heterogeneity, a study the more difficult because the structure is more complex and difficult.

That is what must be rightly indicated so that we may not be duped by the possibility of considering the soul in a quasi-abstract manner, for this field is not closed and is not sufficient unto itself. In relation to the subsequent treatises, that of the soul, although the most important and definitive in its outlines, is always only a first approximation. The more so as this expression ought to be understood with a nuance, for the treatise on the soul is not a first approximation in the general sense which would be equal to the beginning of any science. We find in the treatise on mobile being in general (the *Physics*) a first approximation to the whole study of nature; however, it is not abstract in totality, (79) abstract in the sense in which we now understand this term. It rightly has, as subject, mobile being in its totality, and resolution is made directly to external experience. It comprehends indifferently all moveable things--even the living--with regard to what they have wholly concretized in matter. But the treatise on the soul, we have seen, in the measure in which it is abstract could not, of itself, be reunited to the natural living thing in its wholeness. We cannot even confine ourselves to the plan of abstraction in

order better to know what concerns the soul itself. Since the soul is not perfectly in itself, to seek as a limit a very perfect knowledge of the soul is, at the same time, to seek the knowledge of living things in their totality of natural living things; but this limit is not found in the line of an abstraction which, like mathematical abstraction, could confine itself to abstraction alone in research. Isn't it for this reason that Aristotle calls his treatise "history of the soul"? (80) We can name it thus insofar as it is of the nature of history not to attain to the term of the research. It is thus that St. Thomas understands it: "Et dicit 'historiam', quia in quaedam summa tractat de anima, non perveniendo ad finalem inquisitionem omnium quae pertinet ad ipsam animam, in hoc tractatu. Hoc enim est de ratione historiae." (81)

XIII. CONCRETION OF THE EXTERNAL SENSE AND ABSTRACTION

If, on the one hand, the organization of matter is more heterogeneous insofar as it is the function of an operation less concretized to matter, so that the completely natural science of this operation and of its potency would demand a proportional knowledge of the body, on the other hand, the quasi-abstract study of the inferior potencies does not offer the possibilities nor the fecundity of the study of the potencies whose operations arise more from the soul as such. Although the superior potencies are conditioned by a more diversified corporeal structure, we must not be astonished that their abstract study (it is never perfectly abstract--we must not forget the reservation which we made on this abstraction) is freer and it permits us to know many things with great certitude. Indeed, the operations, in themselves more unconstrained by matter, are in this regard more accessible to abstraction. On the other hand, the external senses and the vegetative functions (besides the fact that we do not experience those latter) are more refractory to this abstraction and demand forthwith that we designate the organs and that we apply ourselves to their examination. Now the study of these organs and of the objects which physically act upon them transport us to the domain where we find ourselves very particularly dependent upon external experience, that is, of the proper data of those same senses: (82) these latter, by reason of their greater concretion in the body (that is what constrains us to have recourse so soon to this method), are at once more opaque in their proper nature and, by this very fact, less apt to procure for us the knowledge of things. Since we have to use these senses nearly full of their proper materiality and in this measure separated from themselves, it is only by means of a long detour through a field as vast and as changing as the experimental sciences, which we will be able to approach--but never entirely--to the scientific knowledge of their organs insofar as they are organs of such and such a sensation. However

far we extend thermodynamics, we never will know (scire) why the phenomenon which it studies gives us the sensation of heat. (83) The distance which separates the little abstract knowledge which we can have of the senses, and the study of its object and of its organ, which involves us in the immense network of the experimental sciences, physical as well as biological, can grow narrower without ceasing, but we would not know how to overcome it. For us, this reduction is a limit, at infinity, where the faculty by which we would know the sense would not only be without matter, not being the act of any part of the body, but independent also of every cognoscitive potency concretized in matter, and perfectly free of the latter in order to know.

The evolution of the experimental sciences permits us to form a more concrete idea of the dullness of the sense. Only compare to the ancient description of the universe which lasted close to twenty centuries, the sketches of ever provisory representations traced by contemporary theories, representations which are no longer even imaginable in the ordinary sense of the word. Bear in mind the science which we would have to have in order to fill up the abyss which separates from its utmost physical components the organ of sense insofar as it is in itself among the objects delivered to its experience (an eye just as I see it with my eyes, skin just as I see and touch it). Surmise what the attempt, hardly begun, of passing over this abyss, demands of artificial means, of experimentations and theoretical construction, and of coordination of disciplines otherwise irreducible, of collaboration among learned men. That is what would allow us at least to catch a glimpse in a concrete way of how the sense is opaque by itself and separated from its proper constitution, but also how far it is from the intellect to which, of itself and on itself, it communicates a mere trifle. Indeed, although the intellect depends always and essentially upon the first data of sensation, upon its constant application and upon its ultimate criterion, it is through the interposition of its proper works that the intellect tends to penetrate the concrete nature of the sense.

In keeping with the experimental sciences, which pursue the knowledge of natural things in their utmost concretion, we were speaking of the sketches of ever provisory representations. We believe that this idea comes a propos among the considerations preliminary to a study of the soul which rests first on the *De Anima* of Aristotle. In this work of the Philosopher, especially in the part devoted to the external senses and their objects, we find much of the matter borrowed from the experimental theories exposed in his cosmology--the theory of the four elements and of the first contraries, of the discussions on the nature and the speed of light. Now, in vain would we search in the *Precis De Psychologie Thomiste* of Professor Cantin borrowings from contemporaneous sciences and considerations of this order. But do we not often say that psychology which is called rational ought to rest upon the experimental sciences? I dare believe that this opinion can be justified by considering why Aristotle

and St. Thomas had done otherwise. This is what we will see in the paragraphs which follow. We warn the reader whom this problem does not concern.

XIV. THE EQUIVOCATION ON "SENSIBLE MATTER"

We have often repeated that natural definitions ought to embrace sensible matter. Even in the study of the soul, we would not be able to abstract from it. Yet, the expression "sensible matter" is not without equivocation. Unless we dissipate its ambiguity, we risk compromising the Aristotelian and Thomistic notion of natural science. It is all the more fitting to do this now that the Aristotelian notion is involved in decidedly outdated scientific theories. In brief, it is necessary to reinstate its fundamental signification. It can be affirmed that the scientific treatise on the soul depends on it. For it happens that, to the most evident and most certain principles, opinions are associated which are logically contradictory. This was the case, with the pre-Socratics concerning the principle "Ex nihilo nihil fit". The ambiguity of the term "non-being" inclined these philosophers to deny becoming properly so called. It is necessary to distinguish in order to save the meaning of the expression.

We have said that the external senses have their concretion in matter, which makes them less susceptible to abstract study. Likewise, scarcely has Aristotle pointed out the different kinds of sensibles than he enters upon the proper object of sight, defines it immediately, and undertakes to "explain the nature of light" (84) by means of chemical and physical theories which are entirely outdated. Would he not have done better to stick to the description of what we sense to compare the objects from the point of view of sensation without seeking to know them in their absolute nature in a treatise as yet abstract?

Let us note first of all that, in the works of Aristotle, the *De Anima* follows the *De Caelo*, and the *De Generatione et Corruptione*, in which he had exposed his doctrine of the four elements and their "sensible qualities". We comprehend consequently that Aristotle had recourse to the theories sustained in those antecedent treatises. But, it seems that in these there is a certain circular process for which we have only been able to account after a slow and long evolution of the sciences: a process concealed by the equivocation on "sensible matter". It is expedient to dissipate this ambiguity, so much the more since a good number of persons have believed that the role which Aristotle allows with his theory of the elements and their sensible qualities compromise the value of his entire treatise on the soul. We define the latter "the corporeal matter

insofar as it is the subject of sensible qualities, cold and hot, moist and dry, etc.". For such is clearly what we understand by sensible matter: matter is that to which we attribute the qualities of which we immediately have consciousness. Among these, the tangible qualities are imposed on us as primaries. The very term "sense" primarily signifies touch, that is, the more entitative of our senses, the one which gives the greatest certitude. But this expression "sensible matter" will become apparently equivocal. Indeed, in the *De Generatione et Corruptione*, the two couples of "tangible contraries", the "primaries": hot--cold, moist--dry, will lead us directly to the absolute elements of corporeal things, the simple bodies: earth, fire, water and air. "The elementary qualities are four, and any four terms can be combined in six couples. Contraries, however, refuse to be coupled: for it is impossible for the same thing to be hot and cold, moist and dry. Hence it is evident that the 'couplings' of the elementary will be four: hot with dry and moist with hot, and again cold with dry and cold with moist. And these four couples have attached themselves to the apparently 'simple' bodies (fire, air, water, and earth) in a manner consonant with theory. For fire is hot and dry, whereas air is hot and moist (air being a sort of aqueous vapor); and water is cold and moist while earth is cold and dry. Thus the differences are reasonably distributed among the primary bodies. And the number of the latter is consonant with theory." (85)

It would not be sufficient to see in this theory a very primitive outline of experimental science. It is important before all else to grasp its fundamental hypothesis: the primary and "elementary" (86) material causes of things are defined by the proper sensibles, and what is more, by the most "elementary" sensible qualities.

It is true that we have arrived at this identification by way of a long detour, but, in the end, the identity is considered as acquired: "Calidum et frigidum, humidum et siccum, secundum quae distinguuntur quattuor elementa", are also clearly proper sensible objects of touch. The theory concludes at the concurrence between what is the most elementary in itself in the material things and what is the most elementary for us in knowledge. And since, in fact, touch is par excellence the sense of certitude, the identification, however hypothetical it may be, of what is primary in things from the material point of view, with that which is the most known to us, will be no less constant. It becomes too reassuring to be called into question. Besides, it has maintained itself for many centuries. We understand that the principle of the primacy of experience in natural science upon which Aristotle insists in the very treatise in which he exposes the theory of the elements, has remained so long inoperative in this domain. (87)

Relevant to the study of the soul, in order to grasp the import, not so much of this fundamental hypothesis (the role of proper sensation in the research of the ultimate constituents of the

universe), but of the particular theory of the four elements, we can recall an observation which Aristotle makes in the *De Caelo* (88), and upon which St. Thomas has commented in the following terms: "Granted that all knowledge comes from certain things which are primary, from which proceed definitions and demonstrations, and that manifestly it is the elements which constitute what is primordial in anything whatsoever (although priority can pertain to certain extrinsic principles, such as the agent and the end); it follows that in order to know the generation of body, it is necessary first to know what the elements of engenderable and corruptible bodies are, why they are elements, how many there are, and what kinds of bodies they are." (89) It is easily seen to what point the very notion of science in this order of things will be modified; the day when we will ascertain that, not only are we ignorant of such first principles, identified with the objects which are at the level of ordinary experience, but moreover that, given the nature of the method which is verified as the only fruitful one, we will never be able to know them. What St. Thomas has said on the subject of the theories concerning the movement of the planets will take on, in this respect, an amplitude which the status of the natural sciences of his time did not permit to suspect: "...It is not necessary that the hypotheses [which the astronomers have imagined] be true, for perhaps the appearances which the stars present could be saved by some other mode of movement yet unknown by men. Aristotle consequently, has used such suppositions relative to the nature of movement as if they were true." (90) Concerning the scientific theories contained in the *De Caelo* and in the *De Generatione et Corruptione*, it will be necessary to say henceforth that "reason is employed in another way, not as furnishing a sufficient proof of a principle, but as confirming an already established principle, by showing the congruity of its results, as in astronomy the theory of eccentrics and epicycles is considered as established, because thereby the sensible appearances of heavenly movements can be explained; not, however, as if this proof were sufficient, forasmuch as some other theory might explain them." (91)

It is remarkable that the first signs of the insuperable distance which separates the elements which compose sensible things, included among them the organs of sensation, from the primary data of the senses have appeared first in the heavens, far from the senses. "It is difficult [says the Philosopher] to carry on research from a distance, namely, on the celestial bodies which are very far from us, since we cannot have a certain judgment on things which are far away. Now, the celestial bodies are not remote from us so much by the quantity of distance according to place as they are by the fact that so few of their accidents fall under our senses, since it is natural for us to attain the knowledge of the nature of a thing by means of sensible accidents. And this latter distance is much greater than the distance according to place..." (92) These are the attempts to render an account of the revolutions of the orbits which will terminate by revealing the breach which separates us even from

the stone and the wood of which St. Thomas speaks in the rest of the passage which we have just cited.

The principles which would correspond in some way to the elements which the ancients believed they had found, are for us at infinity. Thanks to a progressive substitution of hypotheses, we are able unceasingly to approach them more and more, without nevertheless, ever attaining them. But the principles, such as we are able to glimpse through the evolution of physics, are of quite a different nature than that of the elements of Aristotle's physics. Indeed, even the definitions and the relations which are the starting point of the research of the first principles in themselves, are of another order and we scarcely see what they have to do with sensible qualities. And if these definitions neglect all sensible matter, in what sense will they still be natural?

XV. SENSIBLE MATTER AND NATURAL DEFINITIONS

Let us only consider the science which has gone the furthest in the research of the elements, of the "*prima inter ea quae insunt rebus*" (93) --mathematical physics. It will be said that this science is not purely natural. Agreed. But is there another science which approaches as much to the elementary essence of things? Let us remark, moreover, that mathematical physics is not purely mathematical; given the term which it tries to make known, mathematical physics is even more natural than mathematical. (94) Now, how does mathematical physics define the objects which constitute its starting point? By sensible matter? The question is ambiguous. Mass, length, time, color, temperature, etc., are defined by the description of the process of their measurement; by such a number-measurement, obtained by such an operation, such an instrument, etc. (95) That is saying that we imprison ourselves then and there within the domain of the common sensibles, which are all reducible to quantity-- "*sensibilia vero communia omnia reducuntur ad quantitatem*". (96) It is also thanks to this relative abandonment of the proper sensibles that we are able to apply the objects and the formally abstract principles of mathematics to the order of common sensibles, and that in its turn mathematical physics is able to attain unity. (97) But it must indeed be noticed that the common sensibles envisaged in any manner whatsoever do not constitute the proper point of departure of physics. They are only a first datum. Moreover, they must be measured, and the very process of measurement is part of the definition. It is the result of this operation--a result which is not a pure datum of experience--which forms the starting point of this science. But, if the principles of which we speak are number-measurements, "if then only pointer readings or their equivalents are put into the machine of scientific calculation, how can we grind out anything

but pointer readings?" (98)

Consequently, even after having excluded the "elements" of the ancients, the expression "sensible matter" remains equivocal. Let us remark first of all that the term matter should not be confused with the sensible qualities which primarily characterize it in the experience of the senses. Matter is very precisely the subject, it is known only as the subject, of sensible qualities. "Materia enim sensibilis dicitur materia corporalis secundum quod subjacet qualitatibus sensibilibus, scilicet calido et frigido, duro et molli, et hujusmodi." (99) Understood in this way, sensible matter is a thing insofar as it is the subject of different qualities which are perceived by the senses as proper sensibles. But we cannot remain here. Matter is besides the subject of common sensibles, of the figure for example and of everything that we are able to express by a number-measurement. In effect, the common sensibles are always per se sensibles. It is true that they are first known as modalities of the proper sensibles. But one must not forget that these modalities are common, that they are not the proper object of a determined sense, and that if a figure can be seen, it can also be touched. Now, from this fact, common sensibles have a communicability which is particular to them: the blind person and the deaf person can understand physical definitions of color and of sound; temperature can be given a definition which does not make it known as a proper sensible; but it is impossible to reveal the qualities of color or of sound to the blind person or the deaf person. Doubtless, at every temperature, however high or low it may be, there is always quality, but we would no longer call it strictly sensible. In the last instance, this communicability of common sensibles has its principle in the quantity to which they all return and which is in itself the subject of every sensible quality.

Hence in this respect we must consider a double aspect in the common sensible. We know it first under the dependence of some proper sensible. It is necessary either to see, or touch, magnitude, number, figure, movement. But what we perceive under the dependence of a proper sensible is at the same time the subject of sensible qualities. It is precisely this aspect of anteriority which ought to attract our attention. In this point of view, the common sensibles are quantitative determinations anterior to sensible qualities. The surface, for example, which I see in looking at the color of a body, is in reality the subject of this quality which is the color. It is true that I do not perceive it according to this anteriority; however, the surface which I perceive by reason of the color is anterior in itself and does not cease for that reason to be sensible per se. (100) It is precisely this priority in itself of a determination nevertheless sensible per se, which renders an account of the possibility of a physics which neglects sensible qualities. Attention to this aspect of anteriority in the permits the first retreat before objects. We would say that in the perception of the sensible qualities, we are, ourselves, too involved with

objects in their materiality, to attain the detachment which physical perspective particularly requires. Attention to this aspect of anteriority of a per se sensible permits at least the first step backward in the presence of objects. Without a doubt we do not sufficiently take into account everything that implies for us the fact of being first a body among bodies, and of being under the dependence of corporeal organs in order to know the material world.

Let us remark now that this does not deter us in the least from the subject assigned to the *De Caelo*, namely, "*magnitudo et corpus: quia nihil movetur nisi quantum*". (101) But this is not enough. In truth more retreats will yet be necessary. A confusion which impregnates this whole treatise is due to the fact that the quantitative formalities of bodies and of movement have not been isolated by critical mensuration. Local movement is attributed to bodies, and simple bodies are defined, "*secundum gravitatem et levitatem*", but these latter have not been separated from the sensation which we experience in lifting a weight. In order that the definition might be strictly physical, it would have been necessary to adhere to the number-measurement obtained by means of a scale, that is to say to the operational definition of mass. To lift a stone in order to place it on a scale comprises two things which are not easy to separate: the action, the very real effort which we experience, and the result of the operation of the measurement. Nevertheless, the reading of the graduated scale is totally independent of what we experience in lifting the stone. Likewise, in measuring a temperature by means of a thermometer, we completely abstract from the sensation of heat, and even though we would never have experienced this sensation, nothing of thermodynamics would change. It is in restricting ourselves to the result of one measurement that we will be able to engage ourselves freely on the road which leads toward first principles in themselves. As long as we imprison ourselves in the very limited field of the common sensibles uniquely envisaged as modalities of sensible qualities, it is impossible to penetrate into this domain where the quantitative determinations can no longer be presented again as modalities of proper sensibles. It is not necessary to go to the electron, to the quantum, in order to find objects which have no homologues at the level of sensible experience. Looking at it closely, even simple length, when it is a number-measurement defined by the description of the object and of the practical operation which we have effected in order to obtain this number, is only expressible by means of a symbol. The number-measurement is not, as such, an object of sense; and that of which it is the sign is not an object of sense in the manner of the apple. It is less than a name. For this reason, we call it a symbol.

What does "sensible matter" become in this aspect of retreat? Let us remark with Eddington that in truth, "all scientific researches have as a starting point the familiar world and, in the end, must return to it; but the part of the trip during which the physicist is in charge is on foreign territory...In spite of

our efforts to depart properly by rejecting the instinctive or traditional interpretations of experience and by admitting only that knowledge which can be deduced through strictly scientific methods, we cannot break completely with the familiar storyteller. We posit in principle that it is always necessary to be suspicious of him, but we cannot do without him in science. This is what I mean: we fit out some delicate experiment of physics with galvanometers, micrometers, etc., chosen especially to eliminate the fallibility of human perceptions; but in the end, it is of our perceptions that we will have to demand the result of the experiment. Even if the apparatus is self-registering, we will have to use our senses to decipher the recording". (102) We wish to remark expressly that the physical excursion "in foreign territory" is without return under a very fundamental aspect. We do not comprehend any better than at the beginning why the disordered movement of molecules gives us a sensation of heat. Experimental psychology will not tell us any more about it. Proper sensibles are primary and irreducible principles.

Briefly, it suffices that we abstract from this starting point and from this return to the experience of the sense, which is not truly such except with regard to the per se sensibles, in order that the physical world lose all its physical signification. "The physical theories attempt to form an image of reality and to tie it up with the vast world of sensible impressions. thus, our mental constructions are justified only if our theories form such a connection no matter what the manner." (103) The operational definitions depend upon them. But there is more. "Perhaps you will object that although only the pointer readings enter into the actual calculation, it would make nonsense of the problem to leave out all reference to anything else. The problem necessarily involves some kind of connecting background. It was not the pointer reading of the weighing-machine that slid down the hill." (104)

Consequently, in abandoning the Aristotelian theory of absolute elements characterized by sensible qualities, we have not in the least way rejected the general principle that every natural definition ought to embrace sensible matter, whether it is a question of man or of the electron, which, in spite of their proximity, are far removed from us because of this very proximity.

In the two sections which follow, let us now enter upon the question of the provisory character of every theory concerning the first principles which constitute and govern things in the order of material causality.

XVI. THE PROCESS OF INTENTION AND COMPOSITION

We have seen that the ancients thought that they knew these first principles, but we have called attention to the fact that such a knowledge is for us as a limit which we cannot reach. On this point, the testimonies of the most eminent savants are not wanting. Einstein expresses this idea in a well chosen image: "The physical concepts are the free creations of the human mind and are not, as we might believe, uniquely determined by the exterior world. In the effort which we make to understand the world, we resemble somewhat the man who attempts to understand the mechanism of a sealed watch. He sees the dial-plate and the hands in movement, he hears the ticking, but he has no means whatsoever of opening the case. If he is ingenious he will be able to form for himself some image of the mechanism, which he will hold responsible for everything which he observes, but he will never be sure that this image is the only capable one of explaining his observations. He will never be in a proper condition to compare his image with the real mechanism, and he cannot even picture to himself the possibility or the signification of such a comparison. But he believes certainly that in proportion as his knowledge increases, his image of the reality will become more and more simple and will explain more and more the extensive domains of his sensible impressions. He will thus be able to believe in the existence of an ideal limit of the knowledge which the human mind can attain. He will be able to call this ideal limit objective truth." (105)

Franco Rasotti has expressed his thoughts in non-equivocal terms: "The aim of the physical sciences is not in the least to attain an absolute truth: On the contrary, the progress of these sciences has shown more and more the provisory, approximative and, to a high degree, arbitrary character of all scientific construction. The physical sciences do not constitute, therefore, a "science" in the Aristotelian sense of the word, but only a "dialectical knowledge", that is to say the discussion of the consequences of certain principles posited as probables. Nevertheless, if we cannot say that a physical theory is "true" or "false" in the philosophical sense, it is nonetheless true that there are "good" and "bad" theories. The first are those of which the consequences are not disproved by experiment. Moreover, it is demanded that a theory be most simple and most general. We have often seen that the desire to synthesize the knowledge of one branch of the physical sciences in a more simple theory leads to the discovery of new phenomena." (106)

But why is this so? The answer is unanimous: the measurements upon which the whole scientific construction is established are never more than approached. In this regard, it is necessary to consider first the impossibility of an infinitely precise measurement in the domain of the continuum. It would be

necessary, in effect, that the standard of measure be a magnitude equal to zero. In reality, this standard, however small it may be, is simple by hypothesis only--"accipitur ut simplex per suppositionem." (107) But, whenever it is a question of seeking the universal and fundamental principles of this order, every lack of precision is of consequence. Secondly, it is necessary to define the physical properties by the description of their process of measurement, which, in order to be adequate, should comprehend and express all the circumstances of the mensuration. Now, that is impossible; for it would be necessary previously to know in a precise manner the principles which govern the totality of the physical world: it would be necessary to be a separated intellect who would not have any need of experience in order to know the world--"a god contemplating the external world," as Eddington says. (108)

But why can't we proceed, in this order of things, as we have done in the Physics and as we will do in the abstract study of the soul? The definition of movement, for example, is not provisory, and that of the soul will be entirely definitive. On the other hand, a similar definition of the nature of light would be an intolerable barrier. Why, in physics, should strictly scientific truth presuppose a knowledge of principles primary in themselves from the very rigorous beginning? Why isn't the advance toward these principles that of the process of concretion? We shall find the answer to this question by dwelling on the Prooemium to the De Caelo of St. Thomas. (109)

In practical reason's consideration of a house, we can distinguish four processes. Firstly, there is the process according to the order of apprehension. The builder of houses, for example, grasps in the first place the form of the house in an absolute manner, in order to apply it then to the matter. Secondly, there is the process according to the order of intention: the artisan intends to construct the house in its entirety, and it is in view of this totality that he does everything that he does with regard to the parts. Thirdly, there follows the process according to the order of composition, in which the stones are cut, for example, in order to assemble them into a wall. And fourthly, there is the order of maintenance of the work, according to which the artisan lays first the foundation upon which rests the other parts of the house.

In the consideration by speculative reason, we can find processes corresponding to those of practical reason. Thus it is that we consider first the most general, in order to consider afterwards the least general. This is what we have called the process of determination, which corresponds to the order of apprehension in the arts. Thus in the study of nature, we commence with the "communissima" of the book of the Physics, which has as subject mobile being insofar as it is mobile: and we shall do likewise in the study of living things, which begins with the consideration of the "communia omnibus animatis, postquam vero illa quae sunt propria cuilibet rei animatae." (110)

Then follows the order which corresponds to that of the intention, in which we proceed from the ensemble, the whole, toward its parts. But, it is to be remarked that this whole which we are thus considering in the first place is opposed, not to any part whatsoever, but very precisely to the parts according to matter, as opposed to the parts according to species--"prout scilicet totum est prius in consideratione quam partes, non qualescumque, sed partes quae sunt secundum materiam et quae sunt individui." (111) The material parts are the parts without which we can, however, consider the whole. Thus we can consider the circle without considering the semicircle, or animal without considering foot, or man, without Socrates; on the other hand, we would not be able to define semicircle without circle, nor foot without animal, nor would we be able to consider Socrates without man. Besides, the formal parts ("partes speciei et formae") are essential to the consideration of the whole. The three lines of a triangle, the rational soul, and the body composed of flesh and bones, are essential to the definition of a triangle and a man. Let us note, moreover, that in order to have the perfect definition of man it would be necessary to know him with regard to the elements without which he could not be man. (112) Therefore, the consideration of the whole according to the order which corresponds to the intention of practical reason, will depend on the knowledge of the formal parts, without which we cannot truly know it: "hujusmodi enim partes sunt priores in consideratione quam totum, et ponuntur in definitione totius, sicut carnes et ossa in definitione hominis." (113) Applied to the science of nature, this means that we cannot attain knowledge of the material universe in its totality except in proportion as we know its formal parts, that is to say, the parts which are essential to everything insofar as it is a part of the universe. For the ancients, these "partes speciei" of the universe were nothing other than the elements, namely, the simple bodies, envisaged from the point of view of gravitation. (114) This is the reason why we made the treatise *De Caelo* correspond to experimental physics. These parts of the universe and the laws which govern them are common. The weight of a man placed on a weighing machine is registered just as that of a stone. The principles which are primary in this universal order--that is to say, the principles of the physical world considered in itself--are applied just as well to living bodies as to nonliving bodies. From the point of view which occupies us at present, the living things, principal parts of the universe in other respects, are "partes materiae", and not "partes speciei et formae"--they are not part of the definition of the whole in question.

In the third place, there is a process which corresponds to that of composition in the arts. It is especially this order of composition which will detain us, and we will soon see the reason for it. Following this order, we go from simple things to composed things in order to know the latter as much as we can know them through their simple components, in brief, in order to see the role of the components in the constitution of the

totality. Knowing the formal parts of the universe, we would understand the totality which they compose. However, such a comprehension of the totality would be limited to what it is in virtue of these common parts taken as such. For there are, in the universe, wholes which do not owe all that they are to the formal parts alone which constitute them as parts of the universe. this is manifestly the case with living bodies. Although being verified of those bodies, the universal principles do not suffice to explain the living body insofar as it is living. In digesting food or in lifting an arm, we do not act contrarily to the laws of the physical world. And yet, those operations cannot be brought back to the sole knowledge of the formal parts of the universe and of their laws, however perfect this knowledge may be.

We are here in the presence of a composition which is other than that of the universe, but which involves nevertheless, the same parts of the universe. These wholes, in effect, have in turn proper formal parts by which they differ specifically from every other totality. The "partes deffinitivae" of man are not those of other natural living things. Let us note, however, that these proper parts presuppose the first. But the parts which distinguish one thing from another must not be conceived as inserted, after the manner of a wedge, between the parts of the universe; some parts are not mixed with other parts. It is a matter, in effect, of parts by which the whole is defined, and not of fragments. With regard to man, the formal parts of the universe, whatever they may be, are parts of man by the form of man. Surely, whenever we concern ourselves with the sole point of view of these parts of the universe envisaged as such, the totalities in question are no longer reckoned in their specification: the difference of a man and a paving stone placed on a weighing machine is not registered. But it is nonetheless true that the man is not a soul associated with parts of the universe: the latter are indeed parts which compose the body of man, and this body is a formal part of man insofar as he is man.

It is in pursuing this route that we would soon see the parts of the universe assume at once an altogether other aspect. In effect, the beings that are born and that perish are composed of parts of the universe, granted that these parts are primary and universal for everything that is in this cosmos. (115) But, we will agree that for the living body taken as such, this composition is not indifferent. Hot water, whose degree of temperature on the thermometer can be seen, gives me without any doubt a sensation of heat. I then undergo something. And that can go further--when I burn my fingers, for example. Let us put an egg on to boil (more precisely, let us put it in water whose molecules in disordered movement, raise the column of mercury of the thermometer to 100 degrees) and it will no longer serve to multiply the species of fowl. Certainly, neither the study of the sensation insofar as it is sensation, not that of the eggs, concern the physicist as such. But the fact remains nonetheless that I undergo the temperature of the water, and that to undergo

this temperature means, for me, to have a sensation of heat which I perceive as a tangible quality, which, moreover, affects my physical constitution. The physicist will not doubt for an instant that my own temperature, measured by means of a thermometer, is of the same nature as that of the water. It is equally certain that the sensation which I experience cannot concern him--no more than the sterilization of an egg--but although the sensation may be incommunicable, it is there. If the physicist is necessarily indifferent to the manner in which the molecular state of my body and of the objects which surround me affect me, this state which he can measure profoundly involves my physical living being--this can be for me a question of being or of not being, no matter what the weighing machine shows.

That brings us back to the *De Generatione et Corruptione*, whose object is movement according to quality. From the point of view of the living, the formal parts of the universe of which they are composed manifest qualities. Indeed, they do not reveal them by the fact that they are parts of the universe, but formally insofar as they are principles of change according to quality. We recognize these changes most surely at the level of the living (116) which, in the last instance, owe to them becoming, being, and death. There are so many unaccountable things in physics. From the physicist's point of view, the enunciation: radioactivity can kill, is without meaning. And yet, radioactivity does kill.

Only the common sensibles can lead us toward the formal parts of the universe. Now, they are all rooted in quantity: they cannot reveal to us the formal principles of alteration, which are qualities. For, quantity is ordered to quality, as matter to form. We ought not, therefore, to appear too eager to reject in one lump that "local movement is attributed to the elements, not as the hot and the cold, the moist and the dry, according to which the four elements are distinguished...since these are the principles of alteration. On the other hand, local movement is attributed to the elements according to gravity..." (117) The senses reveal to us contrary qualities, and we do not hesitate to say that Socrates is mortal because he is composed of contraries. With regard to knowing what these contrary elements are, that is another question. What precisely are the formal parts of the universe? Physics will never say in a definitive way: here they are! Since those very parts ought to be the parts which are the principles of alteration, we are no more advanced.

XVII. THE PROVISORY CHARACTER OF SCIENTIFIC THEORIES

{Why is the provisory character of scientific theories (118) implied in those processes of the science of nature which

correspond to the orders of intention and composition of practical reason? Let us recall something Saint Thomas has said a propos the order of intention: "Artifex intendit totam domum perficere." It is the house in its entirety which the artisan intends to construct. Applied to the science of nature, this means that the physicist intends to know the whole universe. Now, to have a strictly scientific knowledge of the whole universe (we mean the term in the Aristotelian sense), one would have to know not just any parts, but any of those parts which define the whole--"partes [quae] sunt priores in consideratione quam totum, et ponuntur in definitione totius." (119) We can say that these parts must be those which are most common, that their movement must be the most common--since it is a question of the universe. But what are these parts? Which are the laws of movement in cause? The laws which govern the parts of the universe are necessarily, in this order, the most universal laws--in causando. Yet we do not know these laws.

One might say that if we do not truly know the general laws, much less can we know the particular physical laws. To this we first answer that in stopping thus at one particular physical law we abandon precisely the point of view of the universe. On the other hand, every particular physical law, by the very fact that it is physical, regards the parts of the universe as such; its sufficiency in the closed field cannot be as apparent. Indeed, if it were, one would be able to infer the general laws. That is what demands the *cognitio certa per causas*. In reality, the general laws that we posit are never just hypotheses from which we can depart to logically infer the particular laws with the status of conclusions.

Are we saying that all the experience we obtain in physics is uncertain? Not at all. We do not doubt that there are natural regularities observed. But it is not enough to be certain that nature is the cause of a phenomenon in order to have a scientific knowledge of it. Moreover, the laws, such as physics expresses them, that is to say in the form of algebraic relations between measure-numbers, are just as provisory. (120) It is certain that if we understood the nature which is the reason of the regularity which we express provisionally in such a form, this expression would have to be modified considerably. This nature being nothing other than one of the formal parts of the universe (121), we do not jump to give an account of the regularities--yet this is) what we try to do in the hypotheses--only if we truly know these parts. That is why we cannot even have in this domain a "quia" science. In effect, this would suppose at least the sufficiency of a closed system. But, there is no closed system for the parts of the universe.

However, when with regard to the physical laws, which are schematic and consequently provisory, or of the theories, which are hypotheses, we are speaking of probability. This term must not be understood in the sense which we give it when we say for example: it is probable that yesterday Mister X was at such a

place; or: it is probable that there cannot be had an infinite multitude in act. The truth in these cases can be quite the contrary; whereas the laws, and the theories which are their synthesis, converge toward the truth as toward a limit. In the examples given, the truth or falsity will not affect the terms "Mister X" and "at such a place", nor "an infinite multitude in act" and "possible". Instead the very terms of the laws and of the theories always have something provisory. The "atom" is a striking example of this. Even in neglecting the original sense of "indivisible", and in defining the atom only through the whole process which makes it known to us, it is very certain that the term of the process is not there after the manner of an apple, or, if one wishes, it is there after the manner of an apple which is perhaps a bunch of grapes which is perhaps a tree, etc. To say "which is perhaps" is already to say too much "after the manner of an apple". For, the physicist knows that the atom, such as he conceives it, is a highly impossible thing and that if the universe had to follow the laws of physics, it would immediately collapse.

In certain respects, the savant resembles the artisan. A man is truly the constructor of a house only if he knows the material necessary to make one. (122) However tenaciously convinced he may be of the necessity of a habitation for the unfledged biped, as long as he does not know with what materials a house can be made, nor how to use them, he is not truly a constructor; his ideas on the working materials, however close or proximate they may be, are yet dialectical. In brief, he must know the elements, not in any manner whatsoever, but in a sufficiently precise manner so that the house will stand up and correspond to his end. The savant has a vague idea of the whole which he seeks to know better. He knows that there are universal rules which govern the deportment of the universe, and he knows this better and better. Seeking to know what these rules are, he is given as a limit a knowledge whose exigencies are compared with those of the construction of a house. Were it only to arrive at speculative truth, he would have to know exactly the rules which define the whole. Hindered by the invincible lack of precision of his measurements (for one makes the calculation in proportion as the measurements are precise), not being a separated observer--the slowness of enlightenment recalls it to him--he will have to compromise the truth in order to adhere to an endless approximation. He makes himself an apprentice-constructor. He tries materials, he knows that some would do better than others, but he knows just as well that neither one nor the other will ever cut or saw.

This analogy helps us to understand the illusion of which scientific truth can be the object in physics. In effect, the artisan attains to the truth as soon as he knows how to produce his work--a true house, shoes which correspond to his end. On his part, the physicist possesses that knowledge which is at the beginning of everything that is most impressive in modern technique, from the whistle of the locomotive to the nuclear

bomb. Shall we refuse him scientific truth in the face of such dazzling proofs? Without doubt there is truth here. But does the explosion of a bomb make the truth of the theory of relativity? We have seen that the author of the fundamental equation is the first to deny this. That only proves that we are on the right road, and not that we attain the speculative science of the phenomenon. It is not the physicist as such who makes an engine. Precisely, practical truth does not demand that we know the physical nature of the working materials. If this were necessary, the sculptor would not be able to shape the stone into a statue, nor would the cobbler be able to make shoes. The artisan, in effect, judges the material insofar as it is workable, that is to say in its relation to the work, for the good of the work, and not in an absolute manner. Doubtless the artisan is in speculative truth when he judges that this is a stone and this is water. But a truth of physical science is not attained thus. Such data represent at most a remote point of departure. The physicist begins to measure, and then begins the movement in spirals.

The physicist as such, does not seek to know in order to build. However, he must work "as if" he does. The practical power upon reality will always be his criterion of the true path. "Power over matter that his knowledge gives him is definitely the sole assurance of being on the right road." (123) If one wishes, physics is supported by a practical truth, but it does not consist in this truth. By insisting on the provisory character of his knowledge, the physicist does not make himself a skeptic. He reveals, on the contrary, his sense of truth, he knows henceforth that it is a question of that which defines the universe, and since we do not know the truth about it at the beginning, we will not be able to reunite it to the term. The "*aliqua prima, ex quibus definitiones et demonstrationes procedunt*" are found, for us, at infinity; it will be necessary, in effect, "*quod...prius cognoscatur quae sunt elementa.*" (124)

But, it will be said, how do we conclude from the provisory, dialectical character of physics to the same character for all the experimental sciences? Let us recall what St. Thomas says with regard to the complete definition of man. It does not suffice to know that he is composed of a body and of a rational soul; it is necessary still to specify what this body is right down to the elements. These elements, in effect, are "*partes speciei*" for all natural things. In the measure in which experimental biology studies the corporeal organization of the living thing while depending on external experience, biology also depends upon the knowledge of these elements without which the organized body could not be strictly defined. The most primitive biological units are not what they are exclusive of the parts of the universe which compose them. However, it would not be necessary to conclude from this that before undertaking its proper researches biology must wait upon physics--that is to say [it must wait] indefinitely! Biology has its own data and its own method, but not a strict independence. In short, these two

branches of natural science, physics and biology, converge toward a common limit to which they can approach indefinitely without ever attaining it.

We were saying that in the measure which the artisan judges material in its relation to a work, he truly knows it without, however, knowing its absolute nature. Likewise biology, in the measure in which it can depend upon internal experience, will succeed in recognizing certain organizations of matter, structures and functions outwardly observable, as necessary not only de facto, but for a true reason, for such and such a vital operation. The most evident case is that of the hand, a corporeal instrument quite particularly at the service of practical reason. Of all the organs of the body, the hand is at once the most physical and the most evident expression of the intellect. We ascertain, in effect, that the hand, which obeys reason, ought to be what it is, in order that the intellect may be able to exteriorize its works: we recognize in the hand a certain infinity proportioned to the intellect. From this we can descend toward its characteristic anatomy and toward its physiology to see what ought to be in it in order that the hand may fulfill its function as the instrument of instruments. In the precise measure in which we thus proceed, we go beyond the dialectical phase: it is possible to attain scientific knowledge properly so called without having an exact knowledge of that which is more elementary. We can apply here, once again, what we have said above concerning confused knowledge. But whenever we wish to reconstruct in some way the organ from the point of view of the material cause and of an external experience which abstracts from its function known by means of internal experience, we can no longer go beyond the plan of tentative knowledge.

Among the observations which we read in Aristotle, those which rest upon such a foundation, are just as valid today as they were formerly. But it is not always easy to take into account the lapsed and the permanent.

*** **

Those are, therefore, some of the reasons which to me seem to justify the omission, in an abstract treatise on the soul, of certain problems which arise from experience and from theories of which Aristotle could have suspected neither the complexity, nor the extent, nor especially the provisory character. Let us only bear in mind the amplitude of the studies of physics and of experimental psychology which correspond to his observations on the "nature of knowledge." It seems well that, for the reasons given in sections XI. to XIII., it is better to adhere first of all to that which can be considered in a certain abstraction, and to that which, as the substance of the Physics, can be taught more "per modum doctrinae".

XVIII. LIFE IN THE UNIVERSE

From the moment that we get involved on the road of the "necessitas materiae", (125) science properly so called depends upon a rigorous knowledge of the principles which are primary in themselves. Now, do these principles form in reality an order which is sufficient unto itself, in its own way a separable and closed field? Is there such a system at the boundary of physics? The universe, in its formal parts, is not so simple a system. In living bodies, the laws of the physical world are just as rigorously observed as in inert things. Life does not enter the physical world by breaking into it. If the physicist cannot account either for the structure or for the deportment of the living thing, this is not simply because he is not a biologist. Life is not a phenomenon inter-related in the matter and in the knowledge of the physicist, the soul is not superimposed upon a portion of the universe. My elements (simple bodies or torsions of space, of little consequence) are mine, and I do not doubt that their deportment may be just as lawful as that of the elements of a pebble. Let us agree that my case would complicate things for the physics of a physicist (the elements of a pebble are already remote enough); that would hold nevertheless to the sort of physical nature which is fundamentally mine, while being strictly of the universe which is not a someone. It is certain that by walking wherever I please I do not produce any wrinkle in the physical world, any more than the pebble which rolls or the cat that does not take counsel. Indeed, physics succeeds best where things are most homogeneous and are exposed to the strictness of the immovable abstract, where movement itself is a sort of state--a coordinate. The physicist whom the living thing disconcerts would be like the bricklayer disappointed to see his bricks formed into a house, whereas at the brickyard they were so well arranged in uniform piles. This bricklayer (who does not exist) would have evidently forgotten something essential--he would have turned against himself, against his own trade. At the limit, a physics closed upon itself is without a doubt not less contradictory. In fine, the physicist who dreams of such a future for science would be like those ancient philosophers of whom Aristotle speaks in the Physics, who placed "what is of necessity in the process of production, just as if one were to suppose that the wall of a house necessarily comes to be is naturally carried downward, and what is light to the top, wherefore the stones and the foundations take the lowest place, with earth above because it is lighter, and wood at the top of all, being the lightest. Whereas though the wall does not come to be without these it is not due to these, except as its material cause: it comes to be for the sake of sheltering and guarding certain things. Similarly in all other things which involve production for an end; the product cannot come to be without things which have a necessary nature, but it is not due

to these (except as its material); it comes to be for an end. For instance, why is a saw such as it is? To effect so-and-so, and for the sake of so-and-so. This end, however, cannot be realized unless the saw is made of iron. It is, therefore, necessary for it to be of iron, if we are to have a saw and perform the operation of sawing." (126)

It would be absurd to suggest that the physico-mathematician ought to trouble himself about finality, granted that the whole of the universe, understood precisely in the sense in which we have stated it, is accessible only through measurements, and by the application of mathematics. The latter, in effect, remain in the genus of formal causality (127), in the forms, relations, and proportions. But, if by its method physics is necessarily closed to natural things (even with respect to the strictly physical matter which is theirs) from the moment that they do not lend themselves to a quantitative form, is it not necessary to find here the proof that the physicist is not, by himself alone, the physicus, the naturalis, and that speaking absolutely he is such even less than the biologist?

The integral physicus has become an impossible being. Indeed, let us rejoice about it, but not without regretting these limits of the individual intellect.

*** *** *** *** ***

It is with a certain perplexity that I hand over to my former pupil, the author of the *Precis de Psychologique Thomiste*, these notes hastily and provisionally composed. They will contrast with a very well-ordered, strict, and sober treatise in which there is found most faithfully exposed the substance of the most abstract part of the study of the soul. M. l'Abbe Cantin has erred only in soliciting an introduction to this branch of the philosophy of nature, which he teaches with such competence.

Charles De Koninck